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ABSTRACT

This conference report contains selected presentations and panel discussions concerning the experiences of faculty and students with learner-oriented approaches to college teaching. Following a welcome address by Kenneth R. R. Gross-Louis and keynote addresses by Faith Gabelnick and Linda Harasim, papers are organized in two categories: "Collaboration in the Classroom" and "Computer-Mediated Collaborative Learning." Papers on classroom collaboration are as follows: "Collaborative Classrooms: Building a Community of Writers," (Sharon Hamilton-Wieler); "Making Connections: Minority Students and Collaborative Learning," (Laura F. Smith, Gladys F. DeVane); "Study Guides, Non-Traditional Teaching, and Non-Traditional Students," (Miriam Helen Hill); "Using Collaborative Learning to Help Promote Conceptual Change in Science," (David Maloney); "Collaborative Learning in Physics? Impossible! And Yet...," (Bennet B. Bradson); and "The Chemistry Laboratory: A Site for Collaborative Learning," (Wilmer K. Fife). Papers concerning computer-mediated collaborative learning are: "The Social Context of Networked Learning: Computers as Medium," (Helen Schwartz and Kristin Froehlke); "Hypertext as a Medium for Student Collaboration," (Kenneth Davis); "Supporting Learning with Process Tools," (David A. Goodrum and Randy A. Knuth); "Computer Conferencing for Collaborative Learning in Large College Classes," (Edmund Hansen and others). Panel discussions concerned the following topics: (1) innovative ways of handling classes with large enrollment, particularly at larger universities; (2) positive features of collaborative learning in general; (3) ways in which the instructors on the panel and in the audience had worked to increase the amount of writing in their classes and the quality of that writing experience; and (4) three different projects in which students had taken on major responsibility for their realization. References follow papers. Contains a 79-item bibliography. The conference agenda is appended. (GLR)

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PROCEEDINGS

COLLABORATIVE LEARNING IN HIGHER EDUCATION

Teaching Conference, October 1990

Panel Discussions and Selected Presentations

Sponsored by:

The Division of Development and Special Projects (DDSP)
&
The Telecommunications Advancement Foundation
Tokyo, Japan

DIVISION OF DEVELOPMENT AND SPECIAL PROJECTS (DDSP)
INDIANA UNIVERSITY, AUDIO-VISUAL CENTER
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COLLABORATIVE LEARNING IN HIGHER EDUCATION
Teaching Conference, October 1990

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The conference was made possible by the assistance of the DDSP staff.

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May 1991, Indiana University, Bloomington, IN 47405

Please note:

The transcripts of the keynote addresses and panel discussions were edited for conciseness and readability, hopefully without affecting the tone and content of the oral contributions. Corrected were the obvious grammatical imprecisions of live speech, including the colloquial use of personal pronouns in the plural form (they, them, their) as placeholder for gender-specific references in singular (she, he, him, her). We apologize if this may not adequately represent the usage of some of the participants.

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PREFACE

For more than a decade, the instructional development office (DDSP) at Indiana University has been sponsoring teaching conferences designed to support the University's teaching mission and to focus awareness on current topics of interest to the college classroom. Last October's conference provided a closer look at an approach to teaching that emphasizes student participation and learner self-reliance. For many years, teachers (and their students) have been struggling with pedagogical formats that have stressed the importance of academic content and authoritative expertise. Increasing class sizes and research duties have contributed to placing the spotlight on the instructor. In turn, responsible instructors have been looking for ways to refocus attention onto the learners and the task of helping them become competent problem solvers in their own right.

We initiated this conference because we felt that enough progress has been made in recent years to begin pooling the experiences of faculty and students with learner-oriented approaches to college teaching. We were particularly excited with those approaches that promote not only the learners' cognitive but also their social development. Students have to learn to think critically, but they also have to learn to behave with critical awareness. Since behavior is always socially contextualized, so should learning be embedded in contexts of social relevance. The development of critical knowledge and of social competence go hand in hand. Not only do we need to know, but we also need to collaborate on what it is that we want to know and what we want to do with this knowledge.

At the same time that new teaching and learning approaches emerged, new technologies were developed with a different emphasis. For decades, educational technology had concentrated on individualizing instruction. New technologies such as hypermedia, groupware, and computer conferencing, by contrast, tend to bring people together in discussion and reflection. Learning is no longer conceived of as a one-way street between a tutor (the medium) and a student. Instead, multiple learners use each other as additional resources in trying to gain a deeper understanding of the issues involved in a given content. The combination of these new media with concepts of collaborative learning made it even more appealing to us to sponsor a conference that explored activities at our university in both of these areas.

Although collaborative learning approaches have been around in primary and secondary schools since the 1960s, the term as such is still rather unfamiliar to many college instructors. Many of its ingredients, however, are more common and shall briefly be reviewed for better understanding.

Collaborative learning usually involves some *grouping* of the learners. Putting students in groups rather than having them work on their own is expected to facilitate a variety of processes whose combination constitutes the theoretical framework of collaborative learning. Learning tasks are structured so that they foster *inquiry* over simple acquisition of knowledge. Investigating problem situations that are authentic (or as close to real-world problems as possible) allows learning to be *experiential.* The artificiality of decontextualized textbook knowledge can thus largely be avoided. If students study by themselves, complex problems may prove too difficult and frustrating. The *multiple perspectives* that different members bring to the group make it feasible to have students work on truly challenging tasks. People struggling for the rational solution of a problem engage in discussion and *reflection.* They question each others' assumptions and conclusions and may gradually recognize that knowledge is not a fixed entity but something that is *socially constructed* by communities of inquirers. This view consequently changes the definitions of the roles that

teachers and learners play. Competition among individual learners appears counterproductive. Only a *supportive* environment is likely to promote a learning outcome that combines the maximum number of ideas and perspectives from the group. Teachers are no longer the authoritative owners and distributers of knowledge. Their task is to *facilitate* the learners' knowledge construction. They do not provide the answers, and often they don't even ask the questions. They help the learners find the questions and then struggle for appropriate ways to answer them.

Collaborative learning approaches have had an impact in different arenas of the academic endeavor. Probably their strongest influence can be seen in the area of writing instruction. In teaching composition, it is important to make students consider things from different perspectives. The goal is to help them reflect upon what they put into words, and to create a supportive environment that does not threaten their imperfect attempts at expressing themselves.

Another area where collaborative learning has been important is assessment. Instructors have been experimenting with methods that make evaluation (their students' and their own) more constructive for the learning process. Learning contracts have been negotiated between students and instructor; students have engaged in peer evaluations; on the other hand, instructors have learned to assess their own classroom performance and discuss their experiences with colleagues.

Learning and teaching with cases has been a third stronghold for approaches that usually involve some element of student collaboration. Case studies, in no matter which field, usually support the notion of an inquiry-oriented learning that requires the consideration of different points of view. Getting groups of students involved in discussing the controversial aspects of a real-life case is a logical method for stimulating the kind of thinking that fosters the development of analytical skills.

Peer-tutoring and supplemental instruction have been used to provide support for at-risk students, in many cases minority students. The reduced threat that peer tutors pose to students who might feel lost in a regular class facilitates communication about questions they would not ask their instructor. With regard to minority students, there can be additional benefits if the peer tutor shares the same cultural background and is therefore able to relate more appropriately to the students' particular situation.

Of course, minority students are not the only populations that suffer from isolation and alienation, especially in large universities. Increasing numbers of older returning students are having problems adjusting to the academic environment, and often enough, their younger counterparts face the same sorts of problems. Faculty members themselves are in a relatively isolated position, with few opportunities to exchange experiences with their colleagues when it comes to issues of classroom teaching. More collaboration between students, between instructors, and between students and instructors has led in several colleges and universities to the formation of learning communities that create a different atmosphere for the whole academic process.

These are only some instances in which forms of collaborative learning have played a role in the past. They by no means cover the full spectrum of its potential and are meant only as a first illustration of some of its dimensions. Many of these areas have been addressed by presentations and discussions during the conference, and I will briefly summarize the contributions that are represented in the following chapters. For more comprehensive coverage, a bibliography is provided at the end of these proceedings.

The conference targeted faculty members and associate instructors from the eight campuses of Indiana University. Over forty faculty members from these campuses contributed to the conference with presentations and showcases, and as members of discussion panels. After the welcome address by Vice President of Indiana University and Chancellor of the Bloomington campus Kenneth Gros Louis, the first day's agenda began with the keynote address of Faith Gabelnick. She is Dean of the Honors College at Western Michigan University, co-author of a recent book on Learning Communities (see bibliography), and a leading proponent in the collaborative learning movement in higher education. Gabelnick interacted with the audience, outlining a definition of collaborative learning and its potential at a large research university.

The sessions following the keynote address considered different classroom applications of collaborative learning. Eleven session leaders dealt with collaborative learning techniques in different areas of academia, including business, chemistry, English literature and composition, geology, medicine, music, physics, and sociology (see Appendix). Five sessions addressed more generic issues of collaboration: how to train students in group skills and discussion techniques, how to use collaboration in preparing students for exams, and how to use racial and ethnic diversity in the classroom to enrich learning experiences for students and instructor. Six of the session leaders contributed their research and findings in the format of a formal paper. These papers are printed in chapter 2 of the proceedings.

The afternoon sessions on the first day consisted of panel and small-group discussions that addressed the relationship of collaborative learning to four different contexts. Transcripts of the four panel discussions appear in chapter 3 of the proceedings.

Panel 1, on "Collaborative Learning in Large Lectures," discussed innovative ways of handling classes with large enrollment, which are a fact of life, especially at the bigger universities in the country. With collaborative learning, the students seem better able to maintain a sense of identity in the classroom. They come to know that their opinions count, and, as a result, the quality and quantity of student participation increases. Different means of creating a collaborative environment include the use of a discussion sheet with answers to be completed before class, thus better preparing the student for participation; joint problem-solving exercises; and the use of computer technology to allow for continuation of discussions electronically outside of class time.

In Panel 2, on "Collaborative Learning and Small Group Processes in Seminars," the participants began by presenting the positive features of collaborative learning in general, such as the way it helps students develop and practice communication and critical thinking skills. Collaborative learning was seen as a means of developing in students the ability to analyze, synthesize, and evaluate the materials with which they are confronted. Suggestions were offered for creating an atmosphere in the seminar setting in which collaborative learning can flourish. The use of computer technology was also addressed in two separate applications.

Panel 3, "Collaborative Learning and Writing Across the Curriculum," discussed the ways in which the instructors on the panel and in the audience had worked to increase the amount of writing in their classes and the quality of that writing experience. Suggested means of fostering collaboration included having students critique each others' writing; preparation for a debate, working with a team of peers; and group analyses and write-ups of literary works. Also described was a collaboration project among faculty members of SPEA and doctoral students in English to create a high quality writing program.

Panel 4, on "Student-Organized Collaborative Learning," included reports from three different projects in which students have taken on major responsibility for their realization. The first project paired two graduate students from different disciplines who were jointly researching a topic and benefitting from the juxtaposition of their different backgrounds. Another panelist detailed her work as a peer tutor for minority students in IUB's School of Business. The third group from IUPUI's Project TEACH, featured non-traditional students enrolled in a teacher education program discussing the ways in which the concept of the cohort group had enhanced their learning experience.

The second day of the conference was dedicated to computer applications and their potential to foster collaboration inside and outside of the classroom. Linda Harasim was the keynote speaker for this section of the conference. Harasim is Professor of Communication at Simon Fraser University in Canada. She has edited and co-authored a recent book on online education (see bibliography), and is an internationally known figure in computer-mediated communication and collaborative learning. Her presentation on this very topic included an overview of nearly a decade of her research in this area and a variety of practical hints and tips for the application of this medium. The two keynote addresses are combined to form chapter 1 of the proceedings.

The last segment of the conference was reserved for presentations and showcases of computer applications assisting in collaborative learning. Some of the projects described in these presentations involved a computer conferencing software that is available on IUB's central computing system to all instructors for their classroom use. Other applications included a group decision support system operated by the business school; local area and international electronic networks allowing students and instructors to transcend the boundaries of their classrooms; a computer program designed to allow students to simulate collective bargaining in labor relations; and two hypertext programs to support different types of collaborative writing and reasoning. Chapter 4 of the proceedings features written reports on four of these projects. Two papers have been revised and updated since their presentation at the conference.

Many people have been involved in different aspects of this conference. We want to thank the instructors who presented their experiences to the critically supportive eyes of their colleagues, and especially those who also managed to put them into writing for the sake of these proceedings and of their peers who could not attend the conference. The members of the conference steering committee deserve our recognition for volunteering their time and expertise to the structuring of the agenda as well as to the monitoring of the panel discussions on the first day. Staff and leadership of DDSP and the AV-Center contributed their share to the overall success of the event. We would also like to express our appreciation to Kenneth R.R. Gros Louis, Vice President of Indiana University and Chancellor of the Bloomington campus, who in his opening address conveyed his support for this conference and its mission, affirming the importance and timeliness of this topic.

Last but not least, we wish to extend our gratitude to the Telecommunications Advancement Foundation in Japan, whose generous financial support made this conference and the distribution of these proceedings possible.

Edmund Hansen
May 1991

WELCOME ADDRESS

Kenneth R.R. Gros Louis
IU Vice President & Chancellor

I am very pleased to have the opportunity to welcome you to this conference. I would like to offer my thanks to Anne Bednar and the others involved in its organization.

As many of you know (perhaps too well) each year I find a way to weave into my Commencement remarks some mention of my grandfather--a Huron Indian in Northern Canada--whose only education was in the woods and forests that were his home; and of my father, who did not go beyond the sixth grade, who sat through my graduation in tears, responding with warmth and wonderment to an achievement that was as much his as it was mine. At various receptions after this year's ceremony, a number of graduates thanked me for the comments, but then added that the time had come for them to go out into the real world.

Perhaps it was the failing health of my father, his impending death this fall; for some reason those references to the *real world* rang hollow, even ominous, as I considered what this University represents, what good teaching really is. Thinking back to when I was Dean of the College of Arts and Sciences: I described to the faculty at that time my sense of the value of a liberal arts education. This has developed over the last decade, but the heart of it has remained constant.

"A liberal arts education should also develop vision," I said in 1978, "in the sense of being able to see inside, with integrity, humility, confidence, to know why honest self-examination is not only important but necessary, to know how it can be achieved. It means vision in the sense of seeing out of ourselves, beyond ourselves, to other people with whom we come into contact in our daily lives, to other cultures, past and present, across the ocean and elsewhere in our state, with which we may or may not come into contact, but with which we share our hopes, with which we share this world. A liberal education frees us because it enables us to see better in all senses of the word vision, than we have seen before."

There is a real world, I know, that scoffs at these aspirations; but there is an equally real world that cherishes and endorses them. That's the world we're talking about at this conference; it's the world that my father--with all his experience in the textile mills of New Hampshire, with his business trips on the train to New York City, his connections to my grandfather and the Huron reservation--it's the world *he* called real.

Teaching is a profoundly civil act, a profoundly ethical act, because it asserts the possibility of a receptivity between minds--and in that receptivity there is, every time, every day, everywhere, another example of how people can find common ground and clear it and build a place in which to live together. The University believes that humankind should survive with dignity, with energy, with moral purpose. Teachers accept and understand this belief and share their gift with others. Teaching, at its best, leads us out ourselves into a shared understanding that our hope for a decent civilized life depends upon others sharing the same hope. It seems to me that this is collaborative learning in its highest form.

Many people across the country might be surprised that this conference is taking place here in Bloomington. Too often, the national media, commenting on the educational process, leads us to fine small colleges and the prestigious Ivy League. I believe that institutions like Indiana must join not only as full partners, but with full responsibility, the national discussion about undergraduate education, core curriculum, access, introduction of new technologies, and so on.

Last year, as chair of the Committee on Institutional Cooperation (the chief academic officers of the Big 10 plus the University of Chicago), I was involved in the publication of a booklet called *Values Added: Undergraduate Education at the Universities of the CIC*. It seeks to describe how some of the distinguishing characteristics of the research university and the scholarly activities of its faculty, staff, and students add values to the student experience that are often overlooked in evaluating undergraduate education. In fact, I think it represents quite well some of the strengths of Indiana University. Undoubtedly, a major research university can offer important advantages that cannot be obtained elsewhere.

Research cultivates the critical skills needed to work from problem to solution, to sort out errors, and to pursue a single line of inquiry to a satisfactory end. For many years, of course, one of the challenges facing higher education has been the need to balance between teaching content and developing critical reasons skills in our students. Engaging students in all aspects of this process and strengthening the undergraduate major through opportunities for talented students to pursue independent study beyond regular major requirements is one of the goals of I.U.'s Academic Agenda. Progress sometimes seems slow, however, because this initiative challenges us to rethink and perhaps alter our priorities. Still, there is a unique opportunity here, and I'm delighted that so many of you recognize it.

Of course, there are numerous other advantages: personal interactions between undergraduate students and active scholars provide tangible benefits to both; active scholars are in the best position to incorporate the most recent discoveries and developments in their field into undergraduate courses; education is further enhanced by a constant flow of people and ideas from outside the university; a vast range of options for specialized study are available; the quality of undergraduate education can be greatly enhanced by the contributions of graduate students--some of the best one-on-one teaching in the classroom and laboratory comes from apprentice scholars and scientists; and the essential underpinnings of the research mission include a wealth of libraries, laboratories, computers and other equipment and facilities--to hold and read a 300-year old book may not be indispensable to an undergraduate education, but it enriches it significantly.

There are opportunities of scale here as well: a range of curricular and extracurricular offerings; large faculties bring a multiplicity of viewpoints to their subjects; the student body itself has great diversity; many international relationships provide valuable experiences and challenges; other special opportunities--honors programs, supplementary learning, career counseling, overseas study--are possible because of the size of the institution; scale plays a major role in the scope and variety of services and cocurricular opportunities; orchestra conductors, drama directors, coaches, student affairs advisors, many others, often affect in unexpected ways the student's education and approach to life.

As all of you are well aware, however, these opportunities do not blossom in meaningful ways unless they are nurtured. I believe that IU's Academic Agenda has been and will continue to be very helpful in directing us toward the achievement of collective goals. As faculty, students, and administrators meet to discuss and debate, ways to invest

increasingly precious teaching and research resources in those programs that will maintain and enhance IU's position among the nation's most distinguished educational institutions, we move not only toward greater academic success, but more importantly, toward development of a closer community of teachers and learners.

I think you would agree that all of us are teachers; that all of us are students. John Locke, the 17th century English philosopher who did so much to influence the writers of the Declaration of Independence, once made the statement: "In the beginning all the world was America." Perhaps that sentence more than any other reflects the new awareness, the freshness, that surrounded and influenced Thomas Jefferson and others on his committee who drafted the Declaration. They saw the opportunity not only for new endeavors, but for the development of a new sense of community. Indiana University, higher education across the nation, may be in an analogous position. As we explore the use of new technologies, new teaching and learning methods, we can find common ground, clear it, and find a place to build together.

The opportunities, obviously, are accompanied by possible pitfalls. Some of the old questions that have been a part of our higher education system from the beginning persist even as new ones emerge. With the current changes, for example, come new questions about the university's reward system: is good teaching sufficiently rewarded? Can we continue to encourage the three-pronged missions of teaching/research/service, even as we strive to improve our teaching effort?

I spoke with one faculty member last week who was using the electronic classroom in her course for the first time. She noted the many hours needed to acquire the necessary computer skills to utilize what I believe is an exciting innovation. She remarked also that a certain number of students struggled with the use of the equipment as well. She noted, in fact, that not only might the extra time needed to become familiar with the programming take away from other efforts and eventually have a detrimental effect on tenure and promotion decisions, but that a few students, frustrated with the technology, might express that frustration in their teaching evaluations. The result could well be double jeopardy for non-tenured faculty members.

A few days later, on the other hand, I spoke with another faculty member who was almost ecstatic about the electronic classroom. It saved her time in administering and grading exams; she could get in touch with students easily outside the classroom; she could post grades, give assignments, pass out notes, etc. She was even more excited, however, in describing the students' responses. Individuals who had difficulty with particular problems would post questions on the electronic bulletin board; they then found numerous students who would write back to explain and offer possible solutions. Such interaction, as you know, is accessible to all the students in the class. Some who share similar questions can log on, see this interaction, join in directly, or simply observe as peers struggle with issues of the course. The interaction described seems another great form of collaboration. Still, there is, I believe, the need to evaluate how this kind of learning, how these efforts, should be measured in the tenure and promotion process.

More importantly, I.U. should come together to overcome the difficulties of teaching at a major research university. Even as there are numerous added values, many students in large universities, especially new and non-traditional students, feel a sense of isolation. The larger the class, the more difficult it becomes for students to connect with each other as well as with their instructors. Similarly, one of the commonly expressed feelings which faculty

have about their teaching is that of isolation, even though many of the challenges each faculty member faces in the classroom are common to others.

That is the primary reason why I am so pleased to welcome you to this conference on collaborative learning--because I see the opportunity to break down some of the barriers between teacher and student, between teacher and teacher, to reduce some of the isolation. I see the opportunity to come out of ourselves into a shared understanding that our hope for a decent civilized life depends upon others sharing that same hope.

Best wishes for this conference.

KEYNOTE ADDRESS: "WHAT IS COLLABORATIVE LEARNING?"

Faith Gabelnick
Professor of English
Western Michigan University

Gabelnick asks the audience for its responses to the question "What is Collaborative Learning?" Collaborative learning is lauded for its ability to bring together the various backgrounds and perspectives of the participants to the benefit of all involved. In collaborative learning, students are forced to participate in the learning process as active rather than passive learners. In addition, the interaction among students and the professor in a collaborative situation can eliminate some of the alienation that is traditionally found in the classroom. One of the auxiliary benefits of collaborative learning is its relevance to life beyond the classroom. The ability to interact with one's peers in solving problems or working toward a goal will serve the student well in a variety of real-life situations.

Gabelnick traces the roots of collaborative learning to various social and academic movements of the 1960s and '70s, and attributes the revival of interest in this approach to the "coming of age" of many professors who participated in those movements several decades ago. She offers a reminder that students see professors very differently than professors see themselves. She stresses the need for collaborative learning in order to eliminate the barriers between teacher and learner, and to break down the traditional authority structures which have impeded the development of the skills necessary for critical thinking in today's students.

FG: We're going to work for about an hour, together, on the issue of what collaborative learning is, and why you would want to use it at a research university. It is always amusing to me that administrators talk about teaching at a research university. I wonder why they don't say doing research at a teaching university. I think that sort of sets out our mission for us: in other words, all of us are brought on board to teach at a school, and yet the covert and what has now become the overt mission in terms of status in higher education is to teach at a research university. I was, before I came to Western Michigan University, at the University of Maryland. They consider themselves a research university, and Western Michigan University wants to be one. It's sort of a terrible position to be in, when you want to be one, and right now Western Michigan is in the throes of things that you probably know about very well, namely, how to balance teaching load and the new demands of research. When that happens, the whole challenge of what I consider the main task of the school, which is to work with students, begins to have another kind of a frame. In any case, it seems to me that those of you who come out to an event which looks at collaborative learning, or any kinds of strategies to make your lives more interesting when you are teaching, are a special breed of folks. It has been my experience that we generally talk to people who already agree with us. Is there anybody in here opposed to collaborative learning? I'm not here to sell you on collaborative learning, because I think you're probably as much an expert in many ways as I am. What I thought we would do today is talk a little bit about what you think collaborative learning is, and collaboratively come to some consensus building around ideas of collaboration, and also, play a little bit in groups, so that if you haven't had the fun of collaborative learning, you can work in that way.

My other agenda is sort of to deflate the issue of collaborative learning. In other words, let's take the other side of it, and look at why anybody would want to do

collaborative learning, why it doesn't work a lot of the time, why the students that you have may look at you as if you have three heads. It happened to me a couple of days ago. I was teaching literary interpretation, working with a poem, and I could see a couple of my students were beginning to get restless and wonder what I was up to. As they left the class I heard one student say to another, "This is a really weird class." And the other one said, "Sure beats my lecture class." The idea there was that people were beginning to feel confused, not understanding what this was all about, suspecting me, as you might suspect me: why don't I just come here, give you all the information, give you a good literature review, and give you the theory behind all of this, so that you can go away thinking that I know a lot, and you know a lot, too. That's always the risk when you walk in and say "We're going to learn together," because people immediately will begin to say "She probably doesn't know very much, so she's putting it on us to learn it." Because as those of you who know Perry know, when you see somebody who's supposed to be an authority, and he or she doesn't act like one, you immediately begin to suspect his or her own validity as an authority figure.

What I'd like to do is to start right off with a small collaborative learning exercise, and then proceed to a little bit of the formalistic kind of information about the history of collaborative learning etc., that you probably want to know about. What I'd like you to do is to begin to clump yourself; move your chairs around and form little groups of about five or six. Go ahead, don't be shy, that's what collaborative learning is about.

The title of my speech is "What is Collaborative Learning?" and that always leads me to say "The answer is . . . ," or "Collaborative learning is . . . ," and we know that we can't do that. So what I would like you to do in these little communities of inquiry is to answer that question. Would you share your views with each other, about what collaborative learning is; and then, obviously, I can't do it for everybody--this is also a demonstration of how to work with a class of 100 or 150 people--we won't be able to work with everybody, but I'm going to take some ideas. Craig, would you, and let's see, I need another volunteer to take some notes for me. As people begin to give their ideas about collaborative learning, I'm going to summarize them, but would you both, also, jot down what you hear? Would you work for five minutes on this? What is collaborative learning?

[Small groups work together for five minutes.]

I need to have some reports from a couple of groups. What about over here? Would somebody like to stand up?

A: Well, we started by introducing ourselves to one other. We felt that it was important so that we would know one another, to develop community. We also agreed that it we cannot presume that everyone will know how to work in groups, and that not only do we have to presuppose that people are interested in community, but also that they need to be taught how to work in a group situation.

FG: So those are the "smartypants" over there. They're setting up strategies and structures for collaborative groups. What about this group?

B: We didn't introduce ourselves to each other, because we didn't know about the wisdom of the other group. We felt that collaborative learning has a lot to do with sharing ignorance, but then we felt that somehow sharing ignorance sometimes leads to something which goes beyond the ignorance we're sharing. Something happens when you begin

sharing ignorance, and you find that though you start with very little, it's sort of like loaves and fishes, it begins to expand, and your ideas then begin to integrate with other ideas, and new ideas come out of those ideas.

FG: Would somebody like to connect to that? We have somebody who has set up the strategies, and then kind of sharing ignorance but building around that; we're not really sure what you discovered about it, but you discovered together that you didn't know something. Which is a starting place; does anybody want to build on that?

C: We did some of the same things. We introduced ourselves, in fact we all have a date for lunch, here, but . . . One thing we talked about was that universities seem to have discovered this recently--it's been a vehicle used in public schools for a long time. As for the sharing of ignorance or experience, we noted that people have a variety of experiences. They have many different values and beliefs and perspectives on things. One of the things collaborative learning can do is to bring about a sharing of those perspectives, so that the perspective of someone who's lived in a very narrow environment would be changed considerably, or at least exposed to the point of view of others. On issues, particularly, collaborative learning may be a very useful device.

D: [Speaker cannot be heard]

FG: You're helping your students, in a sense, to participate in the whole process of learning, and to move then into a less passive position vis-a-vis authority, which we can look at as a text, or authority in your role as grader or learner. Anywhere else?

E: [Speaker cannot be heard]

FG: So you're also talking about breaking down the alienation in a classroom, which is part of what the Vice President was talking about. In other words, collaborative learning as a structure necessarily involves a dyadic relationship, and possibly one that expands beyond that. Anything else?

F: We agreed with the definitions of his group, but we want to add that collaborative learning is learning in a group, either small or large, aiming at an agreed-upon specific topic, so after sharing ideas and opinions the result should involve agreed-upon concepts.

FG: A lot of people don't feel like they're doing collaborative learning unless they have a focus and a goal. In other words, collaborative learning needs not only to have a structure, to occur in groups, to have the social component, but also to move towards something which the students can see as a product, or as a goal, or as an outcome. It seems to me if you only have fun and games, then the students may suspect your motives. They may think you're trying to kill time or somehow do something that doesn't move towards the big word in classes, which is grades. In other words, why are your students there? They're there to get a good grade, from you. And if you suddenly say "We need to do this together, we're going to learn together, we're going to participate, and the grading will be collaborative, and the papers will be collaborative," and I know some of you are going to be talking about that this afternoon, I suspect that some of your students may feel as if this isn't a "real class," and the students may be suspicious of what you're doing. I think that, at bottom, is one of the real challenges of collaborative learning.

G: Our culture in some ways prepares students badly for collaborative learning. It's "cheating" to collaborate, in a sense, and the reward systems have always been based on individual achievement, so how, in a collaborative situation, can you reward achievement without busting the collaborative enterprise?

H: As a foreigner, coming from a different country, I find that very true. I agree with you a hundred percent, that in this particular culture individualism, which has its benefits, does deter from learning together.

FG: So the individualistic culture of America, at least the frame of it, may undercut the very thread that we're trying to talk about. Yes, Ma'am.

I: [Speaker cannot be heard]

FG: There's something sacrosanct, certainly, about teachers in classrooms. A lot of teachers don't want other teachers to go into their classrooms. They feel that their own academic freedom, what is called academic freedom, also means "I can do what I want in my classroom, and don't you tell me anything about that."

J: We talked about collaborative learning as a step towards lifelong learning. When you get out of the university you're not likely to be able to take your professors along with you, but you can collaborate throughout your life with other people in terms of a lifelong self-education.

FG: Yes, and people write about that. One of the myths is that the humanities or the people in English are the ones that do collaborative learning. My view is that the scientists know a lot more about collaborative learning, I think, than we in humanities. The whole notion of scientific research, where you put out a piece to the community for discussion, and it's piece by piece, and things keep accruing and building, one on top of another, makes for a collaborative process, or at least it could make for a collaborative process potentially.

K: [Speaker cannot be heard]

FG: There are people who are writing about this. Does collaboration mean consensus? In other words, when you are collaborating, does that mean that everybody has to agree? There might be a common goal, which is to produce some sort of hypothesis or discussion point, but it wouldn't mean that all of the discussion points would necessarily be reduced to either one definition or one final product.

I'm going to stop for a minute. Are you beginning to think of other things to say? Are people getting some more ideas as we talk about this? Let me ask our two folks who have been listening. Could you give me some read on what's been happening and what you've been hearing?

L: [Speaker cannot be heard]

FG: Notice that this process is slow. It's slow, and it moves, and some of you may say, "OK, I'm ready to move on a little bit," while others of you say "Oh, now I'm really getting it, I have some more ideas, I want to say some more, I'd really like to be up here doing this, because I know what I want to say right now!" Some of you may be thinking, "Well, it's time for the coffee break." This will happen in your classrooms--all of those

kinds of things will start happening to you. Some of you may get more energized, others of you may think that this sort of a process really doesn't appeal to you, others may be thinking it's time to, as we say, segue into another area. One of the things that you want to do as teachers is to watch your group. I have this little energy group right here, but maybe it's because they're nearer to where I'm standing--that could be a hypothesis. Maybe the folks in the hinterlands out there may be closer to other sorts of experiences. So one of the things that you want to be aware of is the structure of your group, the process of your group, and the feel and your own experience of it.

Now what I'd like to do is talk to you for a little bit. I'm going to move into a lecture format, and then I'm going to move back into another collaborative exercise which is kind of fun and a little bit different from what we've been doing now.

There have been a number of questions raised. The one that interests me a lot has to do with how you use collaborative learning. Because collaborative learning is something that you know about internally, intuitively, through your life. I don't need to tell you that collaborative learning means working with other people--everybody knows that. I don't need to tell you that it's a social phenomenon--you all know that. Any of you who have children or who have been a child know that that's the way you learn. The mystery has always been why we choose this mode that I'm using right now to be the primary mode for teaching. And I think one of the reasons is because it's efficient. Or at least, the fantasy is that it's efficient. In other words, I'm standing here, and in a few sentences I can begin to deliver a lot of information, and my fantasy is, you're really going to take it in. That really is a fantasy, I must tell you. Because you could now be thinking about what you're going to be teaching tomorrow, or this afternoon, or who you're going to have lunch with, or the movie that you saw last night, or anything. I have no idea, and you don't either, frankly, what's going on in the minds of your students as you speak to them like this. You do have a lot of idea, and you have proof, if you're thinking about validation, of what's going on in your students' minds when you hear them speak in groups. When you hear what they can challenge you about in terms of your own concepts, in terms of the issues that you bring to them. If you're just sitting like this, you don't know. And if you give them an objective test, you can only guess that they know. Because most of the time, they've either guessed what you want them to learn: they're guessing about what you're guessing that they're going to guess about, whatever. We play this sort of loop which says, I'm a little gurgler, and you're the one that's the pourer, you're the pitcher. To paraphrase Paolo Freire's concept of the learner as a passive receptacle, they're these little mouths, and we pour in our collective research and wisdom.

That's the way folks think that this happens, and we all know it doesn't. Quite seriously, we know that it doesn't, because our students drop out of school. Fifteen percent of college students now graduate after four years. And the projection is that over the next few years it'll head up to ten years, which to me is absolutely incredible. Certainly the average stay now at universities is around five and moving towards six years. And one of the reasons is that students "stop out." They're not in all the time. Why aren't they? Well, partly for financial reasons, but partly because they wonder what their whole education is about. I think that's what draws people to collaborative learning: the idea that maybe you can make sense, and help the students make more sense of what we all call higher education. I don't know that it's any higher than anything else, but it is certainly different from education that they've experienced in high school, and also different from what they perceive real life is like.

It seems to me that when you think about the draw of collaborative learning, we're not dealing with anything new. There are books up there, and any of you who have done any research will know that what is known as working in groups, or learning in groups, or something called collaborative learning, really comes out of the 'fifties and 'sixties, and 'seventies. And depending on your political persuasion, you can say that it is because of the feminists--I mean the feminists really brought this to you, we know about working with people--if you're a Gilliganite, or a Belenkyist, you will then say that women's ways of knowing really have to do with connection, with a context, with my honoring you as a learner. If you are working from a feminist theory, you will know that in the 'sixties and 'seventies it was really the feminists who were responsible for collaborative learning. If you were a social activist in the 'sixties, and I think the majority of people here were probably in college in the 'fifties and 'sixties, if you were a social activist, then you know you developed collaborative learning. You know you took education to the streets. You know that you brought it to the administrators, you know that you asked for participation in the governance of institutions like Indiana University and the University of Maryland. When I was teaching at the end of 1969, we threw marshmallows at people to impress upon them how important it was to become involved in the government, to protest the Viet Nam war--that was learning. I was at the first teach-in the United States, I think, in 1965 or '64, at Rutgers University. We sat on the floor in groups. If you're a political activist, you know that you developed collaborative learning. And so we brought it here, and it is absolutely no mystery to me that we who are now in our forties and maybe a little bit older, know a lot, and see collaborative learning as a regeneration. The sign of middle age, you know, is when you remember your youth, and we know what collaborative learning is all about.

If you are a cognitive scientist, however, you know that collaborative learning is really being developed to the theoretical structures of Kuhn, and Geertz, and Rorty, and others, who are looking at the epistemology and the theory of learning. It isn't all this fun and games stuff from the feminists and social activists; it has to do with the cognitive structures and metacognition. This is really where collaborative learning came from, in the 'fifties and 'sixties and 'seventies, in the works of Lewin, and Kuhn, and those who are interested in organizations and social systems. If you are a Parker/Palmite, or people interested in communities of learners, or those who believe that the community of the spirit is involved, then you will realize that collaborative learning came from community development, from those people who work through the Peace Corps, who work in communities of spirit, and communities of inquiry. I came to it through psychotherapy, and reading a book by Irvin Yalom in 1974 on the nature and theory of group psychotherapy. He talked about how to form a group, and I thought to myself, "He's not talking about groups, he's talking about classes!"

My angle has always been, sort of, through all of those, but also through what my colleagues in counseling and psychoanalysis, and psychotherapy and organizational development have brought to me. So I don't care what angle you bring to it--some of you may have yet other angles of vision--what you do when you bring collaborative learning to your students is translate part of yourself into part of the classroom. I want to make that point really clear; in other words, if you come in here, today, and spend the next two days looking only for strategies, it's like going to a store and trying on some hats. Some people look really terrible in hats. What I mean by that is, you can't use collaborative learning as an heuristic which you inject suddenly into a classroom. It must develop and grow, and be part of who you are. And your students will smell that so quickly, you won't believe it. Because they watch you. I had a student who was in a math class, and she complained

about her teacher. And she said, "He's a very boring teacher," and I immediately thought "Oh well, he must not use collaborative strategies," etc. Then I remembered to ask the student what she thought. So I said, "Well, what do you mean, he's a boring teacher?" And she said, "He has a pair of fall pants, and a pair of spring pants and an all year round tie." And what that taught me was, change your clothes more often! These students are watching you all the time, and what they translate into poor teaching may be so far away from what you think, that unless you ask them, you never know. I was just teaching a story by Wallace Stegner, a story called the "The Blue-Winged Teal," (a teal is a duck). I chose it because now, at my advanced age, I think eighteen-year-olds really want to read about other eighteen-year-olds. This was a story about an eighteen-year-old college student and his relationship to his father, and I thought "Oh, this is really going to go over well." It has to do with a man whose wife just died. The student has to come home from school, and the father, after thirty years of marriage, has been released from whatever hold the wife had over him, and has started up a pool hall. He has a pool hall and a little tavern--a bar. The whole thing has to do with playing pool, and the kid dreams about pool to fall asleep. There's another young man playing pool, and there's a great deal of discussion and description about the smell of this pool hall. The smoke, and the alcohol, and the latrine, and all this kind of stuff. I, of course, am thinking the students are really interested in the father/son bit, so I'm going on and on about that, and finally somebody says to me, "You know, that language about the pool hall and the smells is really very accurate. And that's what made this story so meaningful to me." And I, who had never been in a pool hall, said, "Really?" He said, "Yeah, I don't know about the latrine cleaning, but the smell is exactly right--the language that he describes, and how those people move in and out, and the clunks of the ball and the move with the cue, and putting the ball into the pocket . . ." He goes on like this. This is a young man who was just in the Naval Academy, who dropped out to come back to Western Michigan University for some reason. This is a class of 22 students, and I have six males. I immediately think to myself, "Oh, this is a male analogy, all right, what am I going to do with this, I've never been in a pool hall, we'll go with it," so leaping into the abyss, I say "Well, did anybody else think about it in this way? Has anybody else been to a pool hall?" A third of the class raises "her" hand. Then I said to one of the young women, (in my most neutral voice, I thought), "You've been to a pool hall?" And she said, "Yeah, it's the only place I could get a ride in town, I mean we always went to the pool hall." And I said "Oh, well what do you do there?" Anyway, we began to talk about it, and what they talked about was the isolation in the pool halls--in other words, people don't go there to collaborate. They go there to be alone. It is considered a safe and holding environment. It is a place where these students went to think, and to watch their elders. And they found the smells of the towns in the smells in the pool hall. It is an experience totally beyond anything I've had, and yet, working with those students, and listening to them, we got back to the story, which is about the loneliness of that eighteen-year old. And I was going on the totally off-the-wall traditional track, and so I say to you, and you know this, because you're nodding, and I know it too, but I forget it every time I walk into a class, that I've learned, and you can learn, if you listen to your students. That's part of what collaborative learning is. I wasn't afraid to demonstrate to them that I didn't know anything about what they were talking about right then. That was the point somebody was making over here, that you can learn from your students. And if you forget that at any time, you've forgotten what collaborative learning is about.

I want to tell you a couple more things to sort of frame the next two days for you, and then I'm going to give you a little exercise to do which I think you'll find fun. When you're thinking about collaborative learning--I'm taking this mainly from the teacher's

point of view, because I'm talking to you as teachers--one of the issues that you need to remember is that your students look at you very differently than the way you look at yourself. You see yourself, I'm sure, as a nice person. You see yourself as friendly, and loving students. Your students do not see you that way. They see you as a potential grader. They see you as the major hurdle to get over to get to the next class. They see you as a potential reference. They see you as somebody who can either block their application to medical school, or facilitate it. They see you as somebody who should give them an easy grade, or they see you as somebody who looks like their father, or their mother. Or they see you as somebody who could be their big sister, or their big brother, or their grandfather. And you think you're teaching them biology. And that, it seems to me, is why you use collaborative learning. Because once you get in a group with them, and they get in a group with each other, they forget that you are only there to grade them. They begin to see you as someone who can learn with them, and who can teach them things, not only about the strategies of learning how to trade, or learning how to analyze a story, or learning how to do social history, or learning how to do statistical research; they can also see you as a person who can think with them, and help them through. It's like trying to ride a bicycle, or trying to feed your child for the first time. I once watched myself--I had a meta-view of myself--feeding my young child, and as I put the spoon to her mouth, I opened my mouth. I don't know if any of you have ever done that. It isn't that the spoon is coming to you, the spoon is going over there--but that is the phenomenon that your students see. In other words, your child looked at you joining in the act of eating. And even though that's a very early and primitive kind of example, I think that your students then see you joining in the act of reading a text with them, of writing with them--and by the way, if you keep journals or write or give assignments, please do it with them--they see you in the act of inquiry. In other words, it isn't just that they're to do it, and you're to watch it. You do it with them. And you don't have to do it every week, and you don't have to do it all the time, but when you do it, I guarantee you, you change the frame of reference and the authority structure. The authority structure begins to shift and that begins to change them developmentally, and that's part of why we're in here. We're into helping the students develop more critical thinking, and to make judgments in ways they can't make unless we model and work with them.

I'm going to give you a little poem. I gave it to my students a couple weeks ago, and we made meaning out of this collaboratively. I'm going to have you do this for a few minutes, and then I'll have a little bit of show and tell, but it's going to look different to you than last time.

This is a poem that will take you just a second to read. As they're passing them out, let me go through a one-two-three in terms of collaborative learning. If you want to work in structured groups the way we're doing here, work first as individuals. Any of you who are into learning styles or different ways of learning, allow your introverts or people who don't want to work with groups to work privately. Always allow some sort of private time to people first. Give people a chance to settle in. Secondly, move things up to a dyadic view. Then you can move it into a larger group of five or six. If you go beyond five or six as a discussion group, you'll omit the introvert. If you want them to go into pods larger than five or six, you can "harvest the groups." In other words, you can take reports from each of the groups, or you can take reports from selections of the groups, depending on how large the class is. Then you can put selected people from each of the groups in the center of a group, and hold a discussion with those people. That is called a fishbowl--everybody else watches. At that point everybody is on the edge of his/her chair because

they have things to say. Then you move it out into the larger circle, and you can ask them to write about it. Are you with me?

[End of tape side A: some of the lecture is missing]

FG: . . . and then I'd like you to share your picture, as you drink a coke or have a cup of coffee. Show it to someone else, and talk about it, and during the day, get together and see if you can get groups of people together to share a common inquiry. It's not exactly the way you'd think of analyzing a poem, is it? But it's a way that you can work collaboratively to build community of inquiry and a picture of what collaboration is all about. I wish you very good luck in the conference, and I wish you very good luck in teaching. Thank you.

KEYNOTE ADDRESS: "COMPUTER-SUPPORTED COLLABORATIVE EDUCATION"

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Online education, the use of computer communication for education delivery and interaction, uses the technologies of electronic mail and computer conferencing. The most effective focus in online education is on collaborative learning, with tasks adapted to an environment that is text-based. This focus is relevant in courses that are completely online as well as those where computer conferencing is an adjunct to a traditional classroom.

One model for computer conferencing uses two kinds of conferences. Class discussion, analysis, reports, and debate takes place in formal conferences. In informal conferences the students may choose to participate in a coffeehouse discussion or ask their peers for technical assistance, among other options. Students have reacted favorably to the technology. Their participation has been measured in terms of volume and frequency, as well as quality. Online education allows the students more time to reflect on their responses. Contact and interaction with peers proves to be a motivating force. The text-based environment reduces discrimination on basis of age, sex, race, or disability. But technical difficulties are a problem, and the teacher finds himself without many resources or models in designing the online environment. Cost is also a factor. Nevertheless, when computer conferencing is an integrated part of the learning process, its results prove worth the effort.

Today I want to talk to you about new technology, in particular about using computer conferencing for educational interaction. As you know, this work in education is paralleled by developments in business and professional areas with groupware, computer-supported cooperative work, the whole area of collaboration technology. So I have called my talk today "Computer-supported Collaborative Education."

As you are probably aware, the use of communication technologies is growing rapidly in education and in academic institutions. BITNET, the use of electronic mail messages, is becoming an integrated part of faculty/student collaboration. Electronic mail systems, bulletin boards and computer conferencing systems are also spreading rapidly in primary and secondary schools. You probably know of "Kids Net," the National Geographic science project. These new technologies are being used in a number of different ways. Within adult and higher education for personal communication networks, we have "virtual classrooms" in which education is delivered entirely online. Professional development activities use a lot of these technologies, for teacher training; project coordination; research coordination; online journals and newsletters; as an adjunct to face-to-face activities, whether they are meetings or courses in distance education; and international knowledge networking. These are all areas in the broader definition of education that are adopting this new technology.

Today I want to talk specifically about online education. This is the use of computer communication for educational delivery and educational interaction. We have been doing work in this area since the early 1980s; we have been offering courses entirely online since

1986, and in adjunct mode since 1985. The two major technologies under consideration are electronic mail and computer conferencing. But these technologies are different. They should be seen as complementary and not as competitors. Electronic mail systems really are, as the metaphor suggests, one-to-one or one-to-many communication media. Computer conferencing, on the other hand, is a group technology. It was invented in 1971 to facilitate collaboration, to facilitate collective intelligence. It functions to organize many-to-many or group-communication. If we want to support collaborative learning, if we want to have electronic meetings, anything requiring groups larger than two persons, we have to look to systems other than e-mail, because e-mail is not designed for, nor is it able to support group activities.

I don't know how many of you ever worked on LIST-SERVE, the BITNET user groups. I belong to three of them. It is awful. You get all of these mail messages coming in, and you don't know if they are talking about apples or oranges. It's very difficult for you to collaborate because there isn't a shared object. In an event such as this lecture we can collaborate: we have a shared object, we have a room, we are talking in an environment defined by time and space. As soon as we switch to electronic media, we lose that. We need something to hold the group together. Computer conferencing offers that. In a conference, you have a shared environment. We all have access to the same set of notes. We create this set of notes, and what is my "note 1" is your "note 1." And when we get to "note 50," what you see as note 50 is my note 50. We have shared objects, and we have a history of the group.

In a conferencing system we can, moreover, belong to many conferences. All of us may belong to this conference, some of us to this one, others to this or that, etc. We can have different conferences for different topics that are doing different things. As you can imagine, when we move to a new environment, we need to carefully design that environment to ensure that things are going to work. And as we do that--as I'll show you in some of my research results--things work very well, and very interesting things happen. Things that are possible in a face-to-face class are also possible online; and some unprecedented things are possible, too.

Of course, conferencing systems all have personal mail possibilities as well. What I'm saying is that e-mail and conferencing systems are different, they are complementary, and both are necessary. To sum up, e-mail doesn't support group messaging; it doesn't do the work for you; it doesn't give you a group record or a shared object. If you try to hold a class all online using electronic mail, you are going to have an awful lot of organizational work in order to make this group cohere, because you will have to create a shared object somehow, whereas a computer conferencing system does that for you. It gives you a group record and all sorts of other features.

That's why we have been using a computer conferencing system. We use the electronic mail system as a compliment. But the online classroom, online collaborative activities, are done in a conferencing environment because it is designed for collaboration. "Online Education," this is what I call the field (table 1). We don't have a good handle yet for the field. People call it educational applications of computer-mediated communication, the virtual classroom, the electronic classroom, the virtual campus. These are all names that mean more or less the same thing.

Online education has a number of characteristics that define it as a unique environment. I'm going to go through some of those characteristics. These are

characteristics for theory-building, research, design, and implementing. We have to understand what online education is and what it isn't when we try to design it.

Some people think of online education like distance education, and others of us think of it like face-to-face education (fig. 1). When we look at it, it's sort of like distance education in that it is time and place independent and it's mediated. But it's also like face-to-face communication in that it is interactive, it is many-to-many and it is a group environment. So if we go to the distance education literature or if we go to the distance education practice, we are not going to learn how to use this environment effectively, because distance education has hitherto not been able to conceptualize or conduct group learning activities. But of course we can't just look at the face-to-face literature because that's real-time, real-place. So we see that this is a unique environment. Online education shares some attributes with face-to-face, it shares some attributes with distance education, but together it is its own unique environment.

[Question from the audience]

Up to now my work has been at the University of Toronto, the Graduate School of Education (OISE). My work has been almost exclusively with totally online courses. Students come together for a few hours and then they go to all different parts of Canada and some to the U.S., and for the next 12 weeks we work together online. But now, at Simon Fraser University, I do a mix: We have some face-to-face and some online. Other faculty have done work exclusively in the adjunct mode. And at the end of today's talk I have synthesized some of the lessons from different research activities and different implementations of online education from the U.K., from the United States, and Canada.

Even in an adjunct mode, it's different. What we have done is taken group-learning methods, approaches, and techniques from face-to-face and reconceptualized them for the online environment. But frankly, I have stayed away from distance education theory and practice because distance education hasn't conceptualized and can't give me much support with how to facilitate collaborative learning. My focus is on collaborative learning. So when we go to introduce online activities, when we think of different collaborative tasks, we have to think about how we can conduct these in a time-and-place independent environment, in an environment that's text-based. I have identified five characteristics that we need to use if we are going to do research in this area, or build theories, or design online environments. These are the five dimensions to keep in mind:

1. Online collaborative learning is many-to-many.
   This is central, this is a group environment. Anything that we do has to build on the "groupness" of this environment.

2. Online collaborative learning is time and 3. place independent.
   This really changes dynamics. It creates all sorts of new opportunities to have a classroom that's open seven days a week, 24 hours a day. It also introduces a lot of constraints.

4. Online collaborative learning is text-based.
   This has pros and cons.

5. Online collaborative learning is computer-mediated.

This opens up a lot of opportunities, as new developments in computer-mediated environments are introduced.

We find that online education is an augmented communication environment; that it has created active learning, interactive communication, and communication that is equitably distributed. It is accessible anywhere, at any time, and it has generated a lot of user satisfaction.

Regarding collaborative learning: to collaborate is to co-labor. Learning theory and, in fact, business theory are recognizing that we are social animals and that we do things better when we work together. And the real world, once we graduate from high school or the university, is built on team-work or group principles. As a result, at the higher levels of education there is an increased emphasis on group learning; and recently educators have begun to realize its value with children in primary and secondary schools. Collaborative learning means that we need a cooperative task structure, a shared object (table 2). That is why computer conferencing is so important. If you lack the right tools, if you are trying to do it by using electronic mail, it's difficult to set up a group learning environment.

Collaborative learning emphasizes active participation. Peer interaction is one of the principles of collaborative learning, as are shared resources, a common goal, and usually a common reward, although some approaches involve competition among the individuals. These are the features of collaborative learning that we then try to put together in the online environment.

Collaborative learning has both motivational and cognitive outcomes (table 3). It reduces the uncertainty of the learners as they go through complex materials. Peer interaction increases engagement in the learning process. And at the cognitive level, some of the different theories on the effectiveness of the collaborative learning approach have emphasized verbalization, cognitive restructuring, and resolution of conflict occurring within groups that are learning together.

While the lecture is really a broadcast mode--one to many--and tutoring is one-to-one, group learning can be in a dyadic relationship, in the seminar form, or in small groups with the teacher as a facilitator (fig. 2).

What do we do when we go online (fig. 3)? This design is from my course that is completely online. But it seems to me that we can use any or all of these in adjunct mode, which means having a face-to-face classroom and using computer conferencing as an additional resource. It could also mean having a distance education course and using computer conferencing as an adjunct mode. When we do online education, I strongly emphasize that this is an environment, and as instructors or facilitators our role is primarily to structure this environment. I use a student-centered, active learning approach. I put in a lot of time at the outset in planning this environment, designing it, preparing student materials. Once the students go online, I turn it over to them and I go into the background, watching, participating occasionally, but it is run primarily by the students. This is true at both the undergraduate and the graduate level.

Up until December, I taught only graduate students and I was very concerned when I moved to Simon Fraser and had to teach some undergraduate courses. They were in adjunct mode, so I had to do some face-to-face teaching. I was quite worried about teaching face-to-face because I hadn't done it for so many years. And I wasn't sure what

was going to happen when I put undergraduates online. Some of them had to come up to the campus to access the computer. But it worked. I used the student-centered approach for the undergraduates, even in second-year level courses. The students took over as teachers, they presented, they moderated, they synthesized, they did weekly weavings, and they did analyses of the statistics. We had very active learning with 60 students in that class, and they averaged altogether about 400 messages a week. And while they came in at the outset grumbling--some of them were anti-computer--at the end the majority said that this was one of the best courses they had ever taken. They had never met their fellow students to the degree they did in the online course. They had an opportunity to engage with their colleagues to a higher degree than in face-to-face classes.

How do we do it? When I go online, I create an environment. In general I have two kinds of conferences. A conference is like a space; you can open a conference and call it apples and include everyone, and then you can open a conference and call it oranges and invite only five people. If you are the moderator, you can open and close different conferences, and this is what I do. I designate conferences by the type of conference, the size of group, and the duration of the activity.

Conference type #1 is formal. This is where we have the class discussion, the serious part. Each week we have a new topic. These are of limited duration, one week, maybe two weeks. I may have a learning week that starts on a Monday and ends the following Sunday night: it's time defined. And each week we have a different topic.

In addition, we have informal conferences, type #2. Just as in a university you have classrooms and hallways where a lot of learning takes place, and the cafeteria, where probably even more takes place, we have those online. We have an online coffee house; people drop in and chat. This creates the connections, this is the glue; this is the motivational aspect of the group activity that's very important to support. I have something called "assist" which is a technical help. The students help one another. My job isn't to help them get online. That's their job. They help one another if they have problems with modems, etc. We have a learning log where they report their ideas about what it is like to learn online. This is one of my research tools. I'm watching to see what happens. And there is access to the library. These conferences are ongoing, they are there the entire semester. These other ones are not. They are one to three weeks in duration. The informal activities are all plenary; all the students are members of these conferences together.

In the formal conferences I change the size of the group depending on the nature of the task (table 4). Usually I start off with a plenary session. This is important for group building. We start off on some topics together so we all get a sense of group and get to know one another. Since they are going into an unknown environment, I start with what they know, conceptually, since technically I am asking them to make a big leap. So during the first week I usually give them some extra percentage points if they log on. I have a conference called self-introduction where they talk about themselves. I have another conference where I ask them about their objectives for working online and for taking this course; and the third conference that I open is called "Great Debate." This is an interesting technique that has been very successful. I propose a controversial topic related to the course, one that is guaranteed to evoke some reactions. The reason for that is that I want to make this computer screen into a window as soon as possible, so that they stop seeing this as a technology and start seeing it as a doorway. And students report over and over again that this soon becomes a window, and they step through this window or doorway into a

room full of friends. As soon as they get into this debate, they get really intense, they want to say something.

So that's the first week of the semester, which is followed by one or two weeks of full-group discussion. Then we'll move into small groups, because quite often, within a week or two, as the students figure out how to use their modem, all these new ideas are coming up, hundreds of new reactions are entered, and the students can't keep up. So their second reaction is information overload. Therefore, in week two or three I usually break them into small groups.

Within the smaller group, one of the first assignments I give is a "learning partnership." A learning partnership can be used in many ways. In one example, people work in dyads. This gives them a peer in what may be otherwise a totally new and scary environment. So you link them up with Pat or Gary and then they can say to each other, "Isn't this terrible?" or "Isn't this neat?" I do this as a first assignment. To work together collaboratively online isn't easy; to work together collaboratively in any form isn't easy, as we know. Collaboration is good, but it is not easy.

After that, we move to working groups, to a different assignment where they work together in groups of three or four. They do a project, a report, some research activity, and then they bring it back and present it to one another. The final activity is a team debate. This is usually in week 10 or 11 of a totally online class. Again, one of the advantages of the online environment is the record of everything that is written. As educators, we have an environment that we were never able to offer our students before: a transcript of all the discussions. But we don't know how to use it very well. So one of the things that I have done is a team debate, where I give them a position; I divide them in two, I make them defend a "yeah" or "nay" position, and they give their defense based on a review of the transcripts. So they are going through this rich data base of two or three thousand notes, using the search mechanism. My purpose there is to have them make multiple passes through the transcripts, so that they begin to move to higher levels of critical and analytical thinking.

Another thing that I do to help them bridge the gap from traditional learning to online learning is to use metaphors. We even draw diagrams (fig. 4). This was for OISE's electronic campus. When you are an online teacher or an online student, this is really what you have in front of you. You have a screen with your urgent notes, your personal notes, and different discussions. But we conceptualized it as a physical environment. When you log on there are all these different rooms that you can go to: you can drop into the coffeehouse, you can go to user assist, you can go to the library, you can go to the learning log, which is a small-group discussion. You can tell the students that it's like walking into your institution. I give them a sense of architecture. Research from Carnegie Mellon and other places shows that users soon have a sense of place. They really think they are going somewhere, and they have a conceptualization of what that looks like. To help them make that transition, I give them a metaphor at the beginning. I tell them, "There are different rooms and you are doing different things in different rooms."

Referring again to figure 4, in week one, we have face-to-face. Here is the main conference trunk, and I'm branching different conferences off of this. In week one, I open three conferences, one called "intros," one called "debate," and one called "our objectives". Their job during that week is to log on and say something in each one of these conferences. Then in session two, we have an electronic seminar. In week three, we go into small

groups. In sessions four and five, they work in learning partnerships. They do a little project, and they present that to one another and to me for grading.

I don't know whether you have seen the research done in San Diego on children's networks. Researchers found that students do better if they write for a real audience than when they write for an assignment. Well, we could probably have guessed that. We all like to do something if other people are going to read it and benefit from it. One of the advantages of the online environment is that while they are doing this review of the literature or this research, when they present it online, all of the students have the opportunity to learn from it. In fact, students actually begin to engage in one another's presentations.

So after the learning partnerships we have the learning groups. I give them four weeks to do their electronic field research on some particular project. In sections 10 and 11, we move into the great debate, and in the last week, there is the electronic plenary after which we typically do an evaluation.

[Question about grading]

Everyone knows how I will proceed when I grade a project. The technical details depend on which conferencing system I am using; they all have different features. In the OISE system, the students each have their own work space, besides their presentation space. So for grading, I go into their work space, to which only the four group members had access, and give them their grade and an explanation. Or I send them an e-mail message. So grading is private. If there is some misinformation in their presentation, I will say something publicly, maybe query it. My role, generally, is as a background facilitator.

So what happens when they go online? What are the results in terms of their participation patterns? We did some tracking of the students at OISE. A typical class had 15-20 students. These were totally online courses. We had between 20 and 60 conferences open for one course. We do this activity, it's finished, that conference is closed, we do another one. This helps keep the students focused, it keeps that sense of group object. If you have only one conference in which you try to do everything, it gets very confusing for students.

What's most interesting isn't the time online: that diminishes. Our students stop working entirely online and start downloading, working off line. What we looked at was how much they wrote. In some conferences, we had 2600, 3100 notes with 26 students. That is a very rich database of information. On average, students wrote between 5 and 10 notes a week, of which each note was a screen or more. That's a lot of verbalization. If we believe that students learn by articulating their ideas, this environment enables that. Because of the fact that it's open 24 hours a day, 7 days a week, it isn't limited air time. You don't have to compete to have a little kick at the cat. In a traditional setting, if you have a large class, it's not possible for everyone to say something. And even if they say something once, there won't be time for real discussion.

It's also interesting to note that different activities have different participation patterns. The participation ebbs and flows. It's the same as with other human activities: you have meetings, etc. It may depend on the time of day, or the subject; some things require a lot of talking, others don't. It's a procedural activity: when students have a lot of

tasks to do, there will be more messages; if the task is more reflective, there will be fewer messages. Sometimes we get up to 600 notes a week, but usually we get around 150 notes.

Students on average write 7 notes a week. But that's the average. We were interested in the distribution of people's messages per week over the course of the semester. We found that at the beginning, there is a larger spread, with some people writing more, others writing significantly less. This is probably because some people knew how to work with computers or felt more comfortable with them, had a computer at home, or whatever. But after about week four, the distribution spread gets much smaller. Most people are participating most of the time. We have a few extremes, but most people participate most of the time and spread it equitably. This is unprecedented in face-to-face, simply because it's not possible due to time limitations. It's not possible for everyone to participate. It's usually the same three or four students, and we don't hear from the majority of the people. If our online activity starts on a Tuesday and you put in an idea on Wednesday, by Thursday you might have 5 responses to that idea, and by Friday you might revise your original idea according to others' input. So there is a knowledge building process going on. People log on as they get ideas and contribute them. Or they log on because they are curious to see what people are saying, or even more curious to see how people are responding to their idea.

Here is day one of an online small-group discussion (fig. 5). I say something about the readings. They do the readings, they log on and they comment. So Tuesday there are a few notes, Wednesday there are more notes; and then what you see is that students are beginning to build on one another's ideas. Because it's text-based, you can't do what you are doing face-to-face, like nod--meaning, "Yes, I'm listening," or "Yes, I agree." Online, in order to be there, you have to say something. When you want to say something, you have to say something thoughtful because it's presented to the group. You have to articulate your ideas, knowing that you will get feedback on them. You will (a) probably have to deal with conflict resolution, when people disagree with you and you are forced to defend your ideas; or (b) others might add to your ideas; or (c) the ideas of others might lead you to subject your own ideas to a process of cognitive restructuring; i.e., you will have available multiple perspectives on a topic. In fact, students report as one of the advantages of computer conferencing that they are not limited to the teacher's perspective.

Another observation worth mentioning was that in the first few days students were reacting to the readings. After two or three days online, they began to interact with one another's ideas.

We say that online education is a time-independent environment. So we looked at the times when the students log on (fig. 6). And we found that they actually do log on seven days a week, although participation on Friday and Saturday drops off a bit. It's also open 24 hours a day. So do they use it? They do (fig. 7). About the only time they are not logged on is at 5:00 in the morning. You have learning going on throughout the day. People may log on before they go to their job in the morning or they log on late at night. They have the opportunity to log on at their best "learning readiness time." I ask students to log on at least twice a week: once at the beginning of an online week to respond to the reading, and once toward the end of an online week to respond to one another's ideas. It turns out they typically log on 4, 5, sometimes 7 times a week. They soon become addicted. So the problem is not that they are not logging on enough; one of the problems is information overload.

What are some of the advantages (table 5)? We look at the usage statistics, we have them log their responses, and then we give them questionnaires. We are trying to find out what it's like to learn online. When we started teaching online, our courses were really directed at the distance education student at OISE. One of the unexpected outcomes was the student reaction: they said that working online was more fun. There were people to collaborate with them. One of the problems of distance education is the loneliness of the remote learner. It's very difficult to learn all by yourself. I think peer support is one of the critical factors that confounds distance education. So I thought that group support would probably be very effective for distance education. What I didn't anticipate was that there are actually people who prefer online to face-to-face education.

Time-independence is, of course, a critical factor. 24-hour access means that as you are reading notes, you can respond immediately, or you can log off and reflect. You can compose a response. As an instructor you will appreciate the opportunity for students to have thoughtful interactions. This provides interesting opportunities with regard to "situated cognition." Students who have jobs and do other things during the day can link the course content to their job-related activities and ideas. So the schism between theory and practice, learning and work--particularly for teachers--is narrowed through this environment.

Another positive feature of working online is place independence. You can work together based on shared interests and not on shared locations. As a professional, my colleagues are in San Diego, New York, Geneva, London, and Tokyo, and I am in daily contact with these people. For the learners, this means that they can have access to experts anywhere in the world. It's also interesting for you as a faculty member. I use online experts sometimes in my courses. For instance, I ask a colleague from San Diego be the guest expert for that week. Or in a doctoral course, in which I use my book, I have the authors of the different chapters log on. So one week, people from England are the guest lecturers, the next week people from New York are guest lecturing, etc. It's exciting for the students to log on and have access to these experts. It's also interesting for the contributors to get feedback on their chapters.

Many-to-many communication is tremendously motivational. The peer contact is unprecedented. We got responses like, "My husband thinks I am crazy because I didn't want to go away for the weekend; I didn't want to miss out on the discussion going on online." Many-to-many communication is very important for the socio-motivational domain, but also for the cognitive domain. The opportunity to compare, discuss, modify, replace your concepts, and to identify new perspectives is important both emotionally and cognitively.

The text-based environment forces them to verbalize their ideas. It reduces discrimination: ageism, sexism, racism, discrimation against the handicapped. My students report that never before have they focused on the content of a message to the extent that they have online. Face-to-face you focus on what the people are wearing, their tone of voice, their activity, etc. Also we have plenty of data because it's text-based. So you can make multiple passes through the data base.

The fact that the environment is computer-mediated means that all of the new exciting things that are happening in hypermedia and hypertext can now be an augmented educational environment for the learner and for the teacher.

Some of the negatives include technical difficulties. The technology is crude. Of the complaints that we get, 53% refer to technical problems. Information management is another problem. If you are successful, and you have active learning and students are really engaged, you are soon going to face information overload. There are few tools that help us navigate and manage the information successfully as yet. Also, it's a narrow mode of information: you can't do graphics, you don't have sound, etc.

Real-time communication is a problem when decision-making is required in the group work. The fact that in this medium you are not working synchronously makes collaborative decision-making difficult. Say four students are working in a group and they have to have a product done in two weeks. If you, the instructor, don't support them in how to make decisions online, they'll spend a week and a half just figuring out who's going to do what, and then they'll have two days to finish their product.

Unfortunately, there are no models. And this is true for all of us: there are no models for learning online. If you teach business or physics, even if you have never taken an education course, you will know how to be a professor to some degree because you have been taught. You have been in primary, secondary, and university courses; so you have some sense of what works and what doesn't in teaching and in a face-to-face classroom. Online, we don't have that stored experience to draw upon. We don't have a conceptual or an experiential model for how to teach online. That is a problem and it can seem scary.

Another factor is cost. Who is going to pay? There is a budget for face-to-face classrooms. Who pays for the online classroom (especially in a distance education environment)? And of course the health issues are a concern. People are concerned about radiation, back strain, and eye strain. We don't know very much about these problems, but we should be and are concerned about them.

Where do I think the medium is headed? I think that online education is going to be enriched by all the work that's going on in computer-supported cooperative work with hypertext and hypermedia. We are very close to having a multi-media telecommunications learning environment. It won't be long before our students will have video discs and CD-Rom, or will be able to send video. I can imagine an online environment where some conferences are for discussion, others have videos, and students can log on to a very rich multimedia online environment. Some of the projects that we are going to launch very soon in Canada--we have ISDN that's going to support this. . . So hypermedia and hypertext are exciting new tools; decision-support environments; all of these things that are happening in different places for different reasons will offer us tools as online teachers and learners.

I think that when we learn online, three things happen. First, we generate or access ideas. Then we need to link these ideas, because they do begin to be all over the place. Once we begin to link those ideas, we want to structure those ideas, organize them. Conferencing is very strong for generating ideas. Where students really have problems is in linking those ideas. If they want to have their own personal information management space, we don't have tools for that in computer conferencing. That's why I am working on developing hypertextual frontends that will be personal information management spaces to help both online teaching and online learning. So that while you have access to all those ideas, you can download them and organize them for your own use.

In closing, there are three things for faculty to keep in mind (table 6):

1. You must learn the mechanics of online education. How do you get on to a computer conference, open it, upload and download, send messages? I think that we need support for faculty on that frontend that makes it very easy to use this environment.

2. The real challenge for online teachers lies in conceptualizing and designing it. Conceptualizing and managing are very close. If you put your efforts in designing this environment, using group activities, being very clear about what people should be doing at different times and different places, it will be successful.

3. Computer conferencing can't be an add-on; it has to be an integrated part of the course. It's not fair to the students to say, "You're going to get 10% for this assignment online, and the rest is face-to-face." Because if they are going to make the effort to learn this new environment and to use it successfully, you have to acknowledge it. It has to be important to the learning.

The faculty who have been successful are those who want to provide a better learning environment for their students, those who are dissatisfied with what the face-to-face classroom offers. What they want is an environment where their students can be active participants, critical learners, where they have an opportunity to discuss and have equitable access (table 7). I wish you all good luck on it.

Figure 1

Online Education: A New Domain

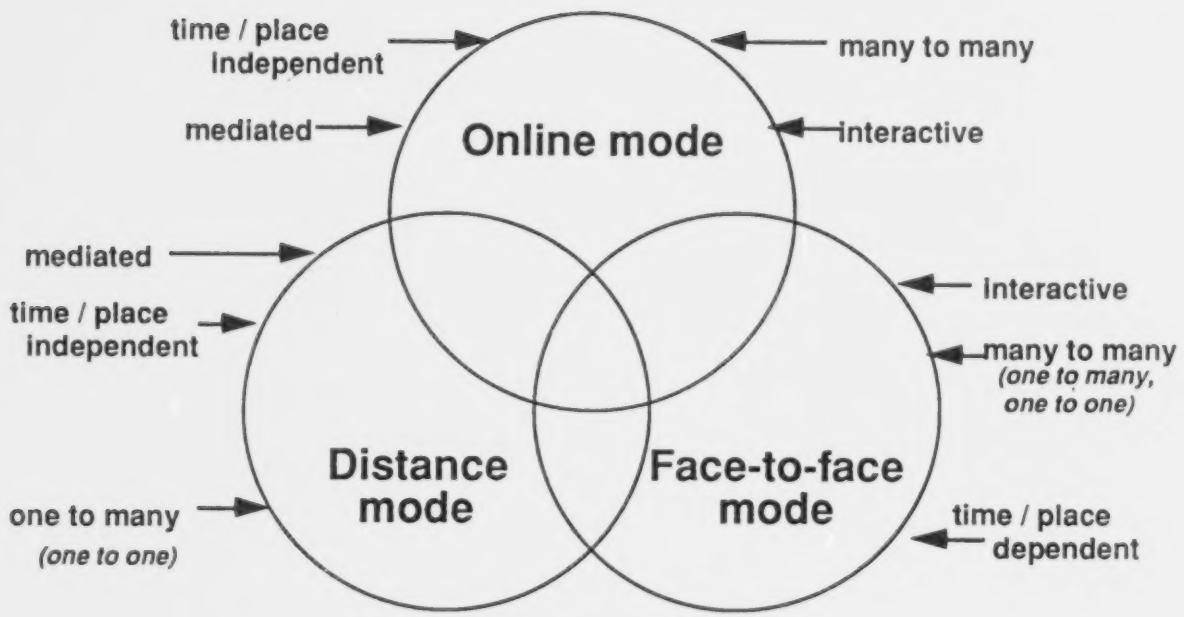


Figure 2

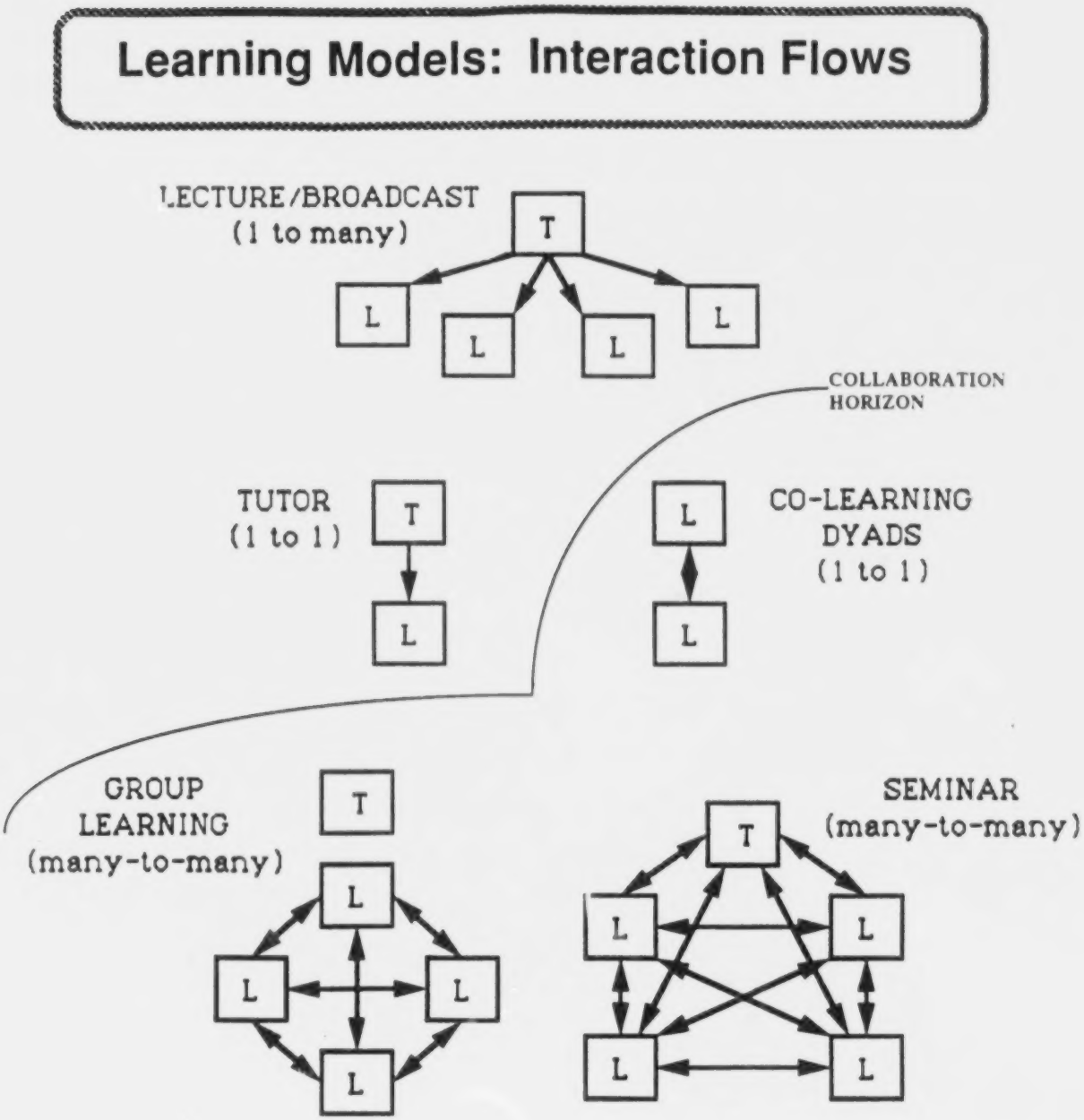

Learning Models: Interaction Flows
LECTURE/BROADCAST
(1 to many)
T
L
L
L
L
COLLABORATION
HORIZON
TUTOR
(1 to 1)
T
L
L
CO-LEARNING
DYADS
(1 to 1)
L
GROUP
LEARNING
(many-to-many)
T
L
L
L
L
SEMINAR
(many-to-many)
T
L
L
L
L

Figure 3

On-line Collaborative Learning Techniques

Formal ('Core') Learning Activities: Limited Duration

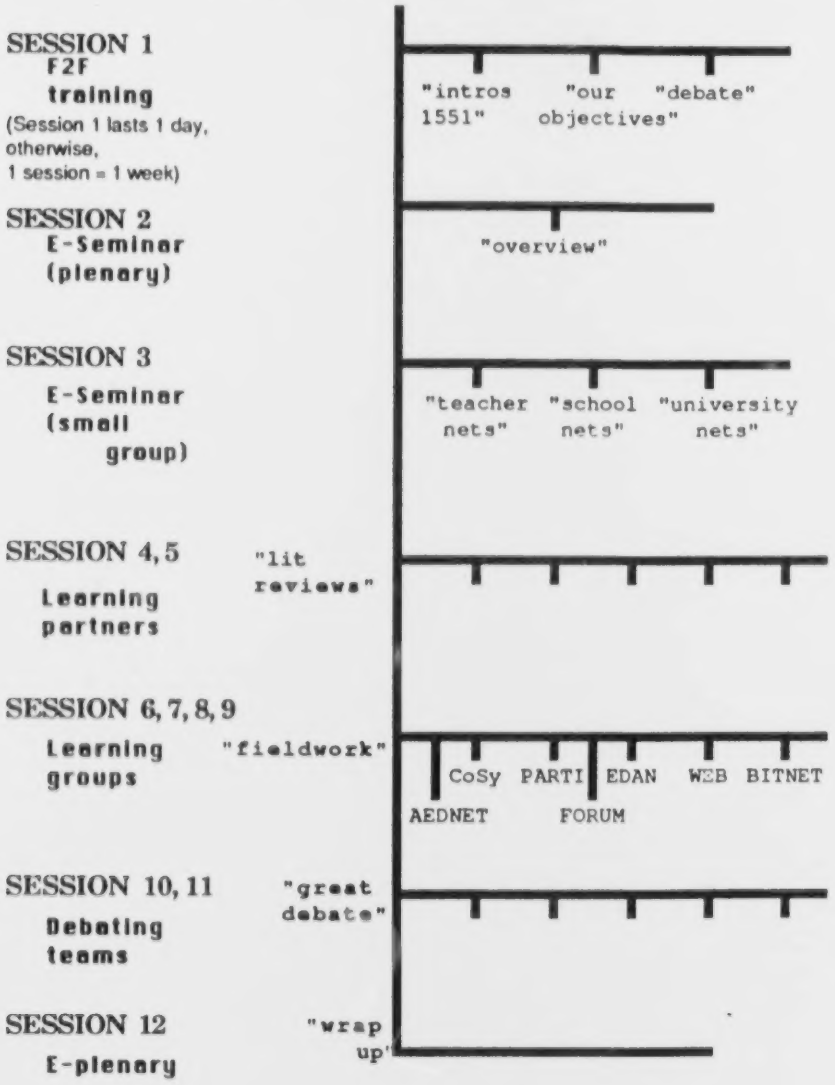
- **Electronic Seminars**
  - **Plenary: Whole Group Discussion**
  - **Small Group Discussions**
- **Learning Partnerships**
- **Working Groups: Electronic Fieldwork**
- **Team Debates**

Informal Activities: On-going

- **Assist**
- **Learning Log**
- **Coffeehouse**
- **Library**

Figure 4

"computer communications"



PARTICIPANT'S ROLE

Practice Parti and system commands. Enter personal introduction and course expectations. Post initial debate arguments.

Discuss assigned readings in one large on-line group.

Choose 1 of 3 topics and read appropriate articles. Enter initial comments, participate in discussion, and summarize key ideas. Participation in other 2 topics is optional.

Choose a partner and critique one article from the set provided. Organize partnership responsibilities and jointly prepare final product.

Choose 3 or 4 other students and a field research project. Coordinate group activities and submit final report.

Debate teams, issues, and positions (pro/con) are assigned by instructor. Defend the assigned position using the

OPTIONAL CONFERENCES "computer communications"

"assist'

A space to request and offer help on the use system--it is a group space, so "assist" one another.

"coffeehouse"

A space for informal discussion and socializing.

'learning log"

A space to share new ideas and insights related to the course's content

'library'

A space for communicating with librarians, about specific holdings

37

35

Figure 5

Weaving Ideas

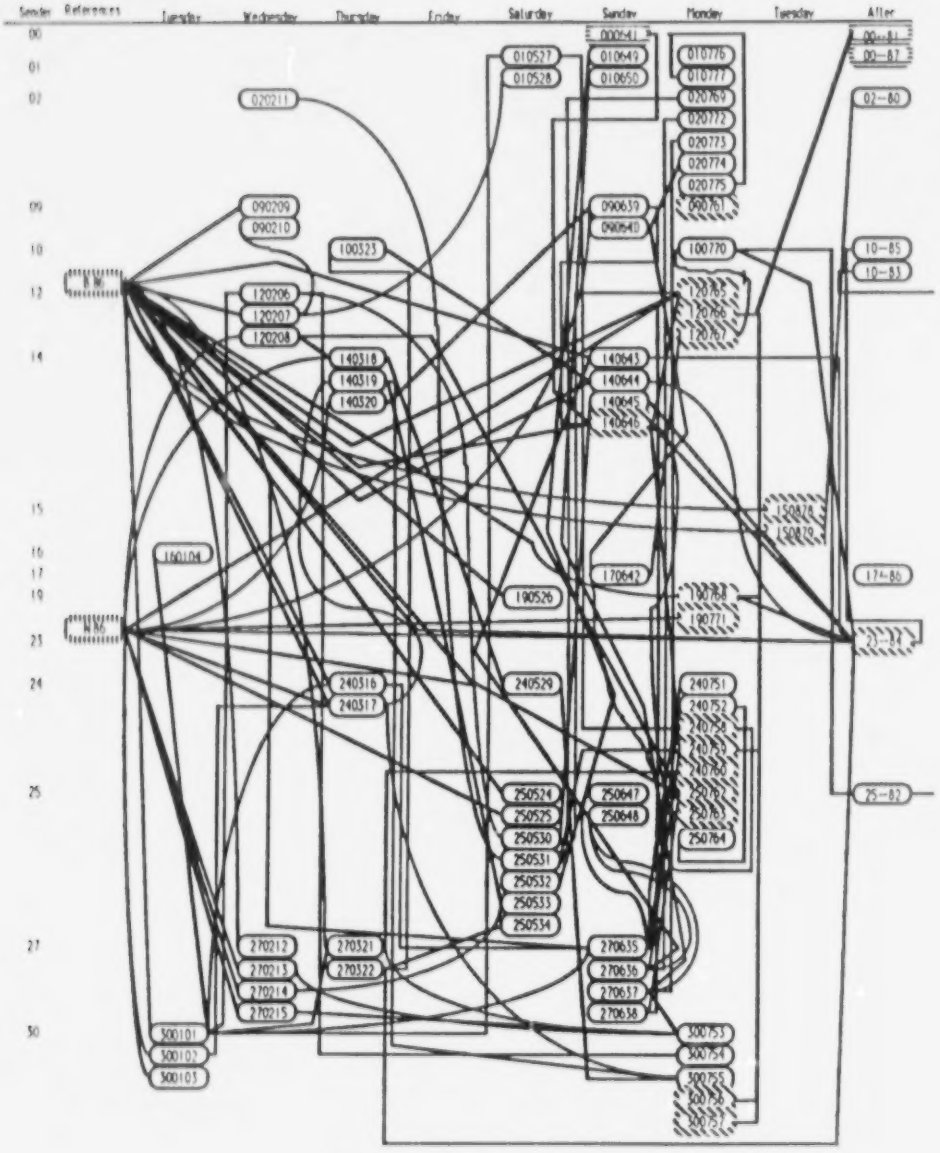


Figure : "school mats" message map

Winkelmans, T. (1988)

BEST COPY AVAILABLE

Figure 6

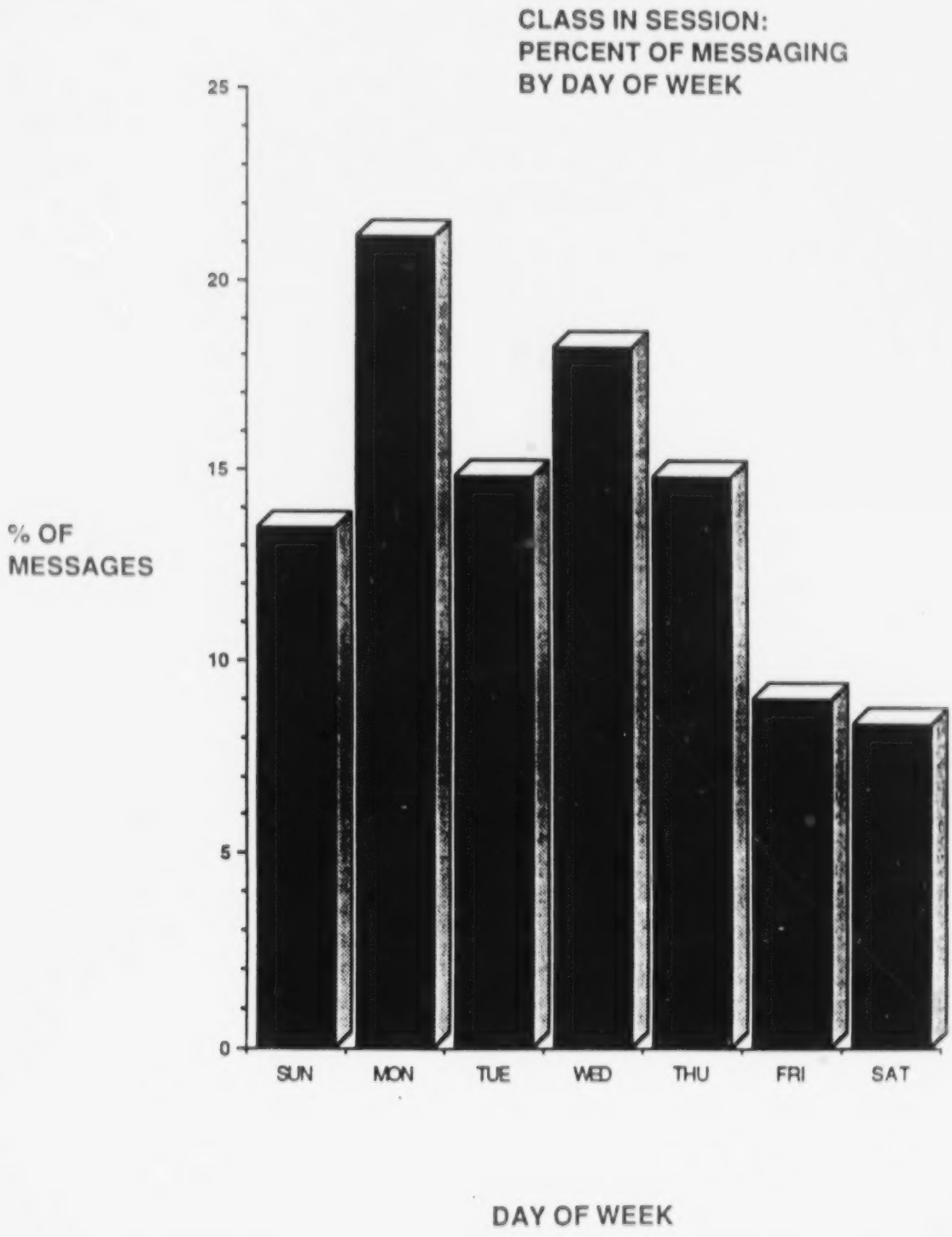


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Figure 7

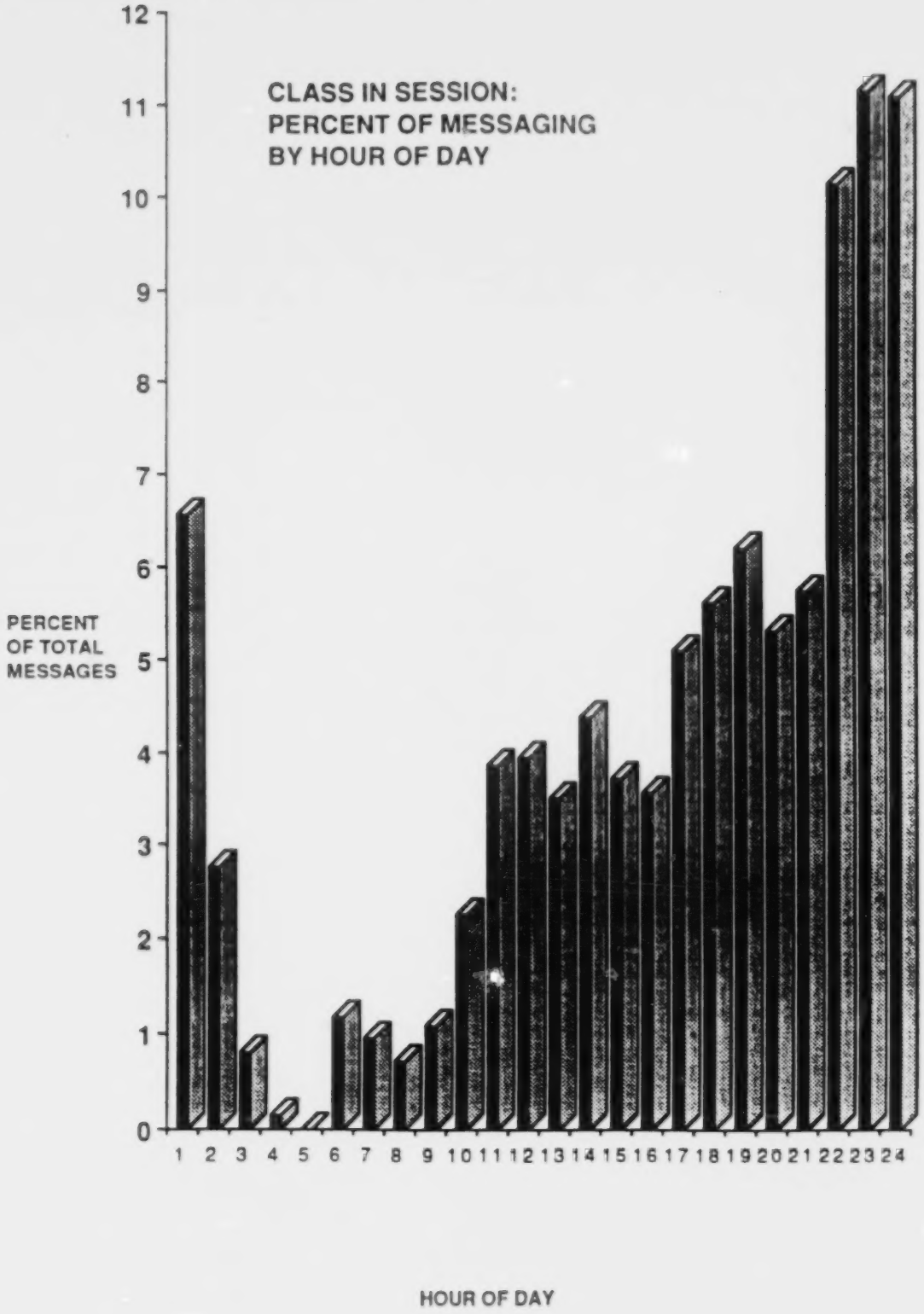

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Table 1

Designing Online Education:

1. How to teach online is a new area, with little research or practical experience to inform it. Unlike f2f, online teachers cannot even draw upon their own experiences as learners.

2. Attention to design is one of the singlemost critical factors in successful online education, whether course activity is totally online or in adjunct mode.

3. Collaborative learning approaches have had the most success in terms of levels of active participation, interaction, and user satisfaction [see over for examples].

4. Design should consider and specify the nature of the task, the focus (and any deliverable), the duration, and the group size, and provide appropriate online spaces and support. A moderator is important for coordinating the activities online and clarifying issues.

5. What kind of courses can be online? Thus far, courses based on computer conferencing have been offered in such subject areas as Sociology, the Humanities, Education, Evaluation, Business, Management, Computer Science, Statistics, Adult Education, Community Development, Womens Studies, Research, Communication, Business Administration, etc. Full degree programs such as MBAs, PhD, and Masters programs are becoming available online, by computer communication.

Table 2

COLLABORATIVE LEARNING

DEFINITION:

Collaborative or group learning, in the traditional face-to-face classroom, refers to a set of instructional methods in which students are encouraged or required to work together on academic tasks (Johnson & Johnson, 1975; Slavin, 1986). While the term collaborative learning encompasses a range of activities, these all utilize *cooperative task structures* based upon individual learner *participation* and *peer interaction* in achieving a *common goal*.

ATTRIBUTES:

1. Cooperative task structure
2. Shared object
3. Active participation
4. Peer interaction: communicating ideas from partner to partner
5. Shared resources
6. Common goal: focussing and maintaining attention on similar aspects of the problem
7. Common reward (sometimes): sharing success and failure

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Table 3

Learning Outcomes:

In several different studies of online education, the conclusions reached are that learning outcomes are at least as good as outcomes for traditional f2f courses.

The average student who participated in online education felt that both access to and quality of educational experience were improved. Not only did students report enhanced cognitive opportunities, but most noted that online interaction was a singularly memorable and unprecedented socio-affective experience: students found it easy or easier to became friends and colleagues online.

Instructors who use computer conferencing do so because they feel that online education provides learning opportunities and outcomes superior in important ways to those available in place-dependent (or distance) classes.

HOWEVER, improved outcomes are contingent upon:

- adequate access to equipment,
- faculty efforts and skill in teaching online
- student characteristics. Students who are motivated to work online and who are self-disciplined, with average or better than average verbal skills are likely to produce superior outcomes.

Students who lack this motivation or who must travel to access a computer are more likely to drop out of an online class or to participate more irregularly.

Table 4

Online Group Learning Designs

1. SEMINARS:
   - -Students do the readings, then logon to discuss, debate, extrapolate, & critique key issues and defend their positions.
   - -Students can take the role of teacher (individually or as a team), to present an overview of the topic to the class and to moderate the online discussion.

2. SMALL GROUP DISCUSSIONS:
   - -Small discussion groups are particularly valuable to facilitate active discussion in a large-sized class or when there are special interest groups on a particular topic.

3. DYADS (LEARNING PARTNERSHIPS):
   - -Valuable early in the online course to act as an ice-breaker, providing a peer in an otherwise new environment.
   - -Valuable for a first assignment: working in pairs is logistically easier & provides a useful entree to group work online.

4. WORK GROUPS:
   - -Groups of 3 or 4 collaborate on an assignment, such as to produce a report, undertake a research task, solve a problem

5. DEBATING TEAMS:
   - -Dyad activity: participants assigned to defend a yea/nay position on a particular topic. Students might be asked to gather their data from the existing conferences, to encourage students to make multiple passes through the transcripts.

6. PEER LEARNING GROUPS
   - -Students assist one another on various tasks (writing assignments, mathematical problem-solving, etc.).

7. SIMULATION or ROLE PLAY
   - a. Online Management Lab, simulating a hypothetical corporation.
   - b. Evaluation Manor, assuming roles of evaluation experts/approaches
   - c. Sam's Cafe: role play & discussion on philosophical issues

8. LEARNING SUPPORT CONFERENCES
   - a. Socializing conferences (i.e., 'electronic cafe')
   - b. Learning Resource conferences (files, online librarian, etc)
   - c. Technical Support conference (mutual 'assist' conference)

Table 5

Issues in Online Education (synthesis of the research)

1. Computer conferencing can be an exciting and satisfying way of increasing the quality and quantity of interaction for both distance and f2f learners.

2. Online education offers unprecedented opportunities for individual and collaborative learning. Online education allows teachers and students to work in ways not otherwise possible: it doesn't replicate but provides new educational benefits.

3. Online activity, if introduced, must be an integral and credited part of course activity. Relegating computer communication to a very small part in a course inevitably leads to marginalization and lack of use.

4. Cost of telecommunication access is an issue; some students may view it as a deterrent if carried out at their expense.

5. Adequate support facilities (software and human) together with customized training materials, and an easy front end are considerable advantages to the adoption of online education.

6. The use of conferencing to achieve educational goals requires careful and extensive structuring of the online environment so that both students and teachers can make productive contributions.

7. Conferencing can tap the invaluable resource of adult students' experience and expertise to the benefit of all concerned.

8. The text-based environment has been found adequate, if not ideal, to support a wide range of educational applications, including business, financial, and management courses. By networking identical machines, it is possible to transmit graphics, color, etc. as well as text.

However, the literature also notes that

9. Group work is difficult even in f2f situations. Asynchronous text-based group work is even more so. Problems can be reduced by providing supports (guides, structures, timelines, etc) to group work.

10. Computer conferencing lacks a conceptual model for teaching and learning. This makes it difficult initially for designing applications, and adoption by new users.

11. Many (traditional f2f/distance) education systems encourage students to be passive recipients of information rather than active searchers and participants. Online education demands and enables active participation by all.

12. CC can be a time-consuming and labor-intensive way of learning, and is highly dependent on the

- quality of input by other participants,
- the instructional design and
- the role of the instructor/moderator.

13.Computer conferencing should be seen as a resource in its own right and not as an appendage or add-on.

16. Online monitoring should be unobtrusive and ethical. The written record provides a tracking function....however, the purpose of the monitoring should be carefully considered and explained to participants. Tracking can be disadvantageous if users feel that they are being "watched" (ie, Zuboff, 1988).

16. Intellectual copyright is an important issue that should be addressed in online academic and course discussion.

Table 6

3 Key Issues to Introducing Faculty to Online Education

1. The Mechanics of OE:

-accessing, down/uploading CC
-the basic operations of reading/writing notes

2. Conceptualizing & Designing OE

-how to design and facilitate collaborative learning in a CC system

3. Managing the OE Environment

-active writing
-active reading
-group processes
-information management
-enhanced multimedia features

Table 7

3 Conditions for Successful Outcomes:

1. Access must be easy (at home or at school). Training, user support, and an easy interface are all critical elements. This is true for the learner and also for the teacher.

2. The purpose of the conferencing system should be very clear, well defined, and well integrated into a course.

3. The organizer or moderator must direct the interaction so that useful discussion ensues.

COLLABORATIVE CLASSROOMS: BUILDING A COMMUNITY OF WRITERS

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The results of a three-year study of collaboration in freshman composition classrooms indicate that collaborative techniques can help students to draw on their tacit knowledge of language to improve their writing. The focus of power in the classroom is thus shifted from the instructor to the students, who work together within groups, evaluating each other's written work. The students gradually move toward an increased awareness of writing as a social act, with social contexts, social implications, and social consequences.

The class begins with a statement of "good writing" formulated by the students themselves, which then serves as a guide to their efforts throughout the semester. Students are asked to formulate goals for the semester and for each writing project as it is assigned. The goals are shared with the other members of the student's assigned group, and the group members are charged with helping the student move toward those goals. The students keep a journal in which they record their reactions to the suggestions and comments offered by the group members in response to their work. This allows them to organize and categorize the feedback, and reinforces their sense of personal control over their work.

August 21, 1989 Journal Entry

I'm so intimidated by this class. I don't know anybody. We've been told we're going to have to read our papers to others in the class. I don't want to. I've done that before, and it's just a case of the blind leading the blind. I just want to do my own work, find out what you want me to do to get an A, and get out of here.

Lisa

December 2, 1989 Journal Entry

When I came into this class, all I wanted was to get an A. I didn't know about other kinds of goals. I didn't know about heuristics and revision. And I never realized how much collaborating with others in a group could help me to become a better writer. To become a better writer. That's my goal now. And I have to credit my group for starting me off on that goal. They told me what I did well--I mean, I knew I was pretty good at description, but their support and comments encouraged me to work harder at it, to push for more interesting ways of writing things. But they also helped me with things I wasn't as good at, like punctuation and grammar, and sticking to a focus. I still would like to get an A, but that's not my most important goal. I want to learn how I can improve my writing so that I become a better writer, and if that earns me an A, that's great!

Lisa

Although some students look forward to sharing and talking about their writing in a collaborative setting, many others, like Lisa, are reluctant. Lisa's first journal entry of the semester mentions two of the most common reasons for this reluctance: (1) students fear exposing themselves, through their writing, to their peers, and (2) students often feel that, since they are all in the same class, their level of expertise is so similar that they won't be able to help each other. The assumption that feeds this second reason is that only the teacher has sufficient knowledge to validate the student's writing. Lisa's first journal entry implies her belief in this assumption when she states her desire to find out what her teacher wants her to do to get an A.

As Lisa's freshman composition teacher, I was not surprised by her initial journal entry. Most of her concerns had been expressed by other students at the beginning of previous semesters, as well as by others in her class. I chose hers to begin this article because her first and last entries serve as articulated touchstones on her journey towards increased awareness of writing as a social act, with social contexts, social implications, and social consequences. I could as easily have begun with the following mirror image of this journey:

> KATHY (a freshman composition instructor): What are we teaching in this research project anyhow? Are we teaching them how to collaborate? or are we teaching them how to write?
> (Aug. 15, 1989)

> KATHY: Now I understand why you delayed answering that question. A year ago I wouldn't have understood your answer; now I wouldn't even pose the question. It's not a question of "either/or"; writing is a collaborative act of writer, reader, and a myriad of shared and evolving contexts. Collaboration is not one way to improve writing. Writing is, in its essence, a collaborative act. The research project helped me to begin to understand that. The ensuing year has reinforced it. A collaborative writing class is the only way to teach writing with integrity. My students prefer it, and I prefer reading the papers that benefit from it. (June 23, 1990)

A happy, productive journey for both Lisa and Kathy! Why, then, does collaborative learning and writing remain, in Anne Ruggles Gere's words, on the "margins of pedagogy" (1987)? Reither and Vipond (1989) offer two interrelated reasons: instructors differ in their understanding of the epistemological as well as pedagogical implications of collaboration and, as a consequence, often use collaboration within the framework of traditional curricula, syllabi, and activities. "Group work" and "peer-tutoring" then become as didactic and teacher-controlled as any traditional lecture, and students retain their dependence upon the teacher for determining and valuing their writing efforts. Lisa wrote, "I have to credit my group for starting me off on that goal [to become a better writer]"-- not her instructor, who was instrumental in establishing her group and enabling it to collaborate effectively, but her group! The instructor dominant in the phrase "find out what you want me to do to get an A" at the beginning of the semester has, by the end of the semester, become invisible.

The quality of this invisibility is a significant determinant of the effectiveness of collaborative learning and writing. As the invisible teacher in Lisa's class, and as the visible director of a three-year research project investigating collaboration in freshman composition classes, including Kathy's class, I made several trial-and-error moves before discovering and defining the nature of teacher-invisibility that can productively enable and enhance student autonomy in writing classrooms. Working with colleagues who were exploring collaboration in their classrooms, selecting from Elbow's and Macrorie's minimal

intervention techniques (Elbow, 1973; Macrorie, 1979), Bruffee's more structured approaches (1985), Huff and Kline's group structuring suggestions (1987), and Elbow and Belanoff's smorgasbord of collaborative strategies (1989), I observed groups collaborating in all sorts of ways, listened to their talk, analyzed transcripts of audiotaped collaborative sessions, and read student journals and written texts. On the basis of my own classroom experiences with collaboration, observations of my colleagues' classes, and analyses of transcripts, journals, and student texts, my own pedagogical approach to collaboration began to evolve. Although subject to continual negotiations and modifications with each new class, the approach I have found most productive has at its core a communally-evolved metalanguage to generate and maintain ongoing dialogue among students and between students and their teacher. To determine its effectiveness, not only did I try it in my own class, in which Lisa was a student, but also on an experimental basis with four instructors--one of whom was Kathy--each with an experimental class trying out this approach and a control class taught the instructor's usual way. By explaining this pedagogical approach to collaboration, I will try to show how Lisa and her fellow students developed the confidence and competence to help each other generate, explore, craft, and critique their ideas for written text, how Kathy came to see collaboration as an integral part of teaching/learning writing, and how I became invisible.

Autonomy through discourse: Establishing a shared metadiscourse about writing

David Bartholomae (1983) and Patricia Bizzell (1986) have both written of the importance of a shared universe of discourse for learning in educational settings, one that acknowledges and draws upon students' diverse discourse communities while initiating students into specialized academic discourse communities. Lev Vygotsky assumes a shared and common discourse when he writes of the importance of language in social contexts for moving through the "zone of proximal development" to new or deeper understanding (1962). Michael Polanyi writes of the rich reservoir of tacit knowledge we all have, waiting to be tapped through conversational and experiential prods and probes (1955). According to Noam Chomsky (1965) and Dell Hymes (1980), this reservoir of tacit knowledge includes an extensive understanding of language (Chomsky and Hymes) and of how language works in a wide range of social contexts (Hymes). And yet, what composition teacher has not faced the challenge of a silent class looking only to her as the fount of all wisdom and knowledge about language and writing? My problem, as a writing teacher, was to find a way to enable my students to talk about their written texts using their collective understanding about language and about writing. To impose my terminology and language values, or the terminology and language values of an unknown textbook author, without acknowledging my students' knowledge of language and writing in their respective discourse communities would undermine the integrity of any approach to collaboration. The establishment, therefore, of a shared metadiscourse, based on students' views of what constitutes "good writing" and using students' language as much as possible, seemed an appropriate beginning for a semester of collaborative learning and writing. Working in small groups to determine qualities of "good writing" and then as a class to shape them into a statement that would be meaningful and agreeable to everyone in the class, we came up with the following:

Our class statement of "good writing"

Good writing
flows smoothly
moves coherently from one idea to another
is organized according to ideas and intentions
conveys the writer's vision to readers
understandably and interestingly
elaborates appropriately to develop
message/point/focus/stance/thesis/purpose
with appropriate
mechanics
invites reading
lingers in the memory
is honest, sincere, authentic,
sparks personal meaning: stimulates feeling and/or thought
has something that sets it apart, above the mundane:
alive
fresh
playful
surprising
unique
has impact!

Each word, each phrase was contributed, explored, and explained by members of the class, so that all students felt ownership in the discourse we agreed would form the basis for our semester's discussions about writing. Each student carried a copy, for easy reference when formulating writing goals and discussing each other's written texts.

Autonomy over individual goals and objectives: Group histories

With increasingly demanding curricula and course syllabi, class time needs to be used as effectively and efficiently as possible. George Hillocks (1986) points out that the most effective learning occurs in classrooms wherein there are clear and specific objectives or goals, writing problems or tasks that engage students with each other throughout different processes, and high levels of peer interaction concerning specific tasks (122). This environmental mode of instruction can increase student autonomy and commitment when students determine their own goals, decide how they might go about achieving them, and reflect upon their success in having achieved them. Group histories can facilitate this growing autonomy and commitment in collaborative classrooms.

Each writing group designs a folder wherein each group member records the following information, using the metadiscourse agreed upon in the class statement of "good writing":

a) (soon after completing the class statement) one or two major writing goals for the semester
b) (in the early stages of each paper) one or two goals for each particular writing assignment
c) a goal for each collaborative session (when the session is going to be a major part of the class period)
d) a mid-semester analysis of whether and how these goals are being met, and what the student might do if they are not being met (at mid-semester, students are given the option to form new groups)
e) an end-of-semester analysis of whether and how these goals were met

All members of the group read each other's goals so they know what to focus on when helping each other, and also so that they have an idea of what others in the group perceive as writing problems. These group histories also contain the names, addresses and telephone numbers of all members of the group, so that they can arrange to call each other for out-of-class collaboration, or can contact absentees to let them know what transpired in class. The message is implicit but strong: students are responsible for determining what they want to achieve in the class; they are responsible for helping each other to achieve these goals; their instructor has confidence that they have the competence and motivation to fulfill these responsibilities.

I call these folders "histories" because they are documents of intellectual and social growth in the classroom community. Lisa explained earlier how her goals became more sophisticated as they acknowledged the intellectual force of social interaction while writing. Brian, another student in the same class, shows in his mid-semester reflection a similar growth (even though he addresses his reflection to me--it took a long time for me to become invisible to Brian):

> When you first asked us to write goals at the beginning of the semester, I didn't really know what you wanted. My goal was to get an A and write better. But now I see that you want us to determine for ourselves what we need to do to improve our writing and to become better writers. My goal now is to make every word count, especially my nouns and my verbs. My writing group helps me by pointing out vague or useless words, like thing and nice and boring verbs. I help myself by reading with more awareness of the words that professional writers use (October 16, 1989).

Autonomy directing reader response: Questions to initiate group discussion to each draft

Sarah Freedman has pointed out how peer-response sheets thoughtfully prepared by teachers can result in brief, trivial verbal exchanges that do not even begin to engage with the ideas or the crafting of ideas in students' written texts (CCCC, Atlanta, 1987). Hillocks' study of classroom modes (1986) and my own observations and experience suggest that just letting the students "have at it" by responding at the intuitive, gut level can result in engaging chat, but not necessarily effective talk about crafting writing. Pat Belanoff and Peter Elbow (1989) have drawn together several kinds of collaborative strategies based on questions that evoke responses ranging from just listening to the text being read to describing particular features of the text to analyzing particular features of the text to critiquing and evaluating particular features of the text. In the early part of the semester, several of these strategies are modelled in a whole class setting, initially by me, but, later, as students become more familiar with each other and with collaborating, by student volunteers. As students build their repertoire of collaborative strategies, they choose with the increased power of heightened awareness the kinds of questions that will provoke the kinds of response or assistance they require. Each new or revised draft presented or read to the group for response is accompanied by two or three questions formulated by the author, questions which indicate the growing control of the writer over his or her own writing concerns. That students can appreciate this increased authority and control is indicated in a comment made by Tracei, another student in that class, during a whole class discussion:

> becoming a better writer means you are more in control. It means that you know more about what you are doing and why you are doing it. It means that you know what you can do by yourself and what you need help for . . . . It means that you know your work will be read by someone else so you have to make it fit your purpose and [the readers'] needs. And [it means] you know more about how to do that!

Autonomy responding to group suggestions: Journal reflections

The debate triggered in John Trimbur's response (1989) to Harvey Wiener's assertion that evaluation of collaboration should hinge upon the effective evolution of consensus (1986) highlights the dynamic interaction that can lead to learning in collaborative groups. Both Wiener and Trimbur agree that the process of achieving consensus can be important in collaborative learning, but they disagree on whether it is essential to effective collaboration and on what aspects of working collaboratively benefit from consensus. For example, procedural decisions usually require consensus or chaos could result. A focus for discussion might require consensus on particular occasions, and stylistic consistency on multiple-authored texts would benefit from consensus. However, responses to written text are, as Stanley Fish (1986) points out, so idiosyncratic that a call for consensus might easily silence a tentative, inquiring voice in the group while it enforces a more strident, dominant voice. For this reason, I ask that students write journals after each collaborative session. These journal entries react to the group discussion, elaborating upon which of the comments were most and least helpful, which the student might incorporate into the next draft and why, and which (s)he rejected and why. In this way, the writer remains in charge of the authored text, while articulating and therefore organizing and categorizing the kinds of suggestions that are helpful and the kinds that are not. For example, the complaint expressed in the following extract from Susie's journal was common, especially early in the semester, before students realize fuller roles for their collaborative groups:

> I wish they wouldn't just tell me about punctuation and grammar. I can fix that later. I want to know if they like my paper, and why they like it, or, if they don't, then what I can do to make it better. I want to talk about the bigger problems we talk about in class--the focus, the development, and especially my use of language, because I'm trying a whole lot of different things with language (Susie, September 24, 1989).

To extend this growing awareness of the kinds of responses that might be more helpful, I suggest that students also reflect upon how helpful they have been to others in the group, and how their ways of helping have changed as the semester has progressed.

Control over teacher's response: Letters of transmittal and response

The collaborative chain I try to forge in my writing classes has three interlocking links: whole class, small group, and student-teacher. I therefore want student writers to direct my responses to their writing just as they direct their group responses. Furthermore, much recent research has questioned the effectiveness of teachers' responses, suggesting that either students do not read them or, that when they do read them, they frequently misunderstand them. When students direct my reading of their writing, they have a vested interest in reading my responses, and, since they are the ones who have chosen the categories or areas of concern, they are less likely to misunderstand my comments.

Every composition handed in for my reading, whether it be mid-draft or final draft, is accompanied by a letter of transmittal that gives the following information:

a) goals for this particular composition (using the metadiscourse of the class statement of "good writing")
b) how the collaborative writing group helped the student to achieve these goals (or hindered him/her)
c) any particular risks taken, or worries, or features of the writing that especially please the student
d) directions on how the reader/teacher should read and respond to the paper; what, in particular, the student desires comments about.

After each composition, students write letters of response to my comments in order to maintain ongoing dialogue about writing using the metadiscourse established by and within the class. Because of the group members' contributions to the evolution of any written text, students are encouraged to include their group members' reactions to my comments as well as their own.

From dialogue to dialectic: The final frontier of autonomy

Although this triple-tiered pedagogical approach to collaboration may seem at first blush to be highly prescriptive, it is intended primarily as a mechanism to enable students to take more charge over their writing goals, processes, and valuations. However, at the same time that it is a mechanism, it is also an ideological statement of a particular epistemology of writing. It asserts that writing is a context-bound, communally-evolved, socially-based act; that students have a broad, socially-shared yet idiosyncratic base of knowledge about language; and that, with some enabling teacher-interventions, students can draw upon their tacit knowledge of language to help each other write more effectively. The move from dialogue to dialectic parallels the move from a classroom that "does group work sometimes" to a classroom of collaborating students. For students to gain autonomy as true student collaborators rather than as teacher-directed peer groups, collaboration needs to be an integral part of learning and writing in every class period. When I asked Lisa why she thought that her experiences with collaboration in freshman composition had been beneficial, her immediate response was, "We do it every day." She went on to explain:

> At first, I thought, Oh no, more wasted time, when we started, but then, as we did it every class, and learned more about different ways it can help us with our writing, I began to look forward to it. And that's really saying something! I hate listening to somebody lecture for 75 minutes. This is so much more interesting, and helpful. If you had told me at the beginning of the semester we would be spending most of the class time in groups by the end of the semester, I would probably have dropped out and looked for a different section. Now, I don't know how I'll write anything once I lose the support of my group. We even meet to help each other with papers in other classes.

To Lisa, collaboration has become not an extra activity, to be done when there is time, or when her teacher thinks it might be a good technique for a change, but rather an essential part of her processes of learning and writing. She sees herself as a qualified reader of her peers' papers, and recognizes the ability of her peers to help her respond to the needs -- and sometimes idiosyncracies--of different readers. In echo of Kathy's statement that "A collaborative writing class is the only way to teach writing with integrity," Lisa sees writing as a social act with social implications and consequences:

> I never really thought before of someone actually reading my paper. Of course the teacher always did, but I mean a real reader. I never thought my writing could influence how somebody thought about something. But I loved it when Brian laughed at some things I wrote, and I was amazed when Chris got really angry at something I wrote about men. I love having an audience to read and respond to everything I write (Journal, November 2, 1989).

Has Lisa simply switched dependency on her teacher to dependency on her group? And, if so, where then lies her autonomy as a writer? It begins, I suggest, in her recognition that her peers have authority as readers of her work, just as she has authority as a reader of theirs. The authority previously vested in her teacher begins to be shared, a redistribution of the locus of power over making meaning and valuing written expression in the classroom. This redistribution of authority is aided in the pedagogical approach to collaboration I have just described by the initial valuing of students' views of what constitutes good writing, expressed in their own language, by the students' determining and formulating their own writing goals, and by the students' taking charge of authorial concerns in their writing, concerns that will arise out of their own writing goals, curricular goals, syllabus requirements, and reader reaction to daily writing, whether the reader be the teacher, a fellow student, or the student-writer herself. An end-of-semester class discussion about what it means to become a better writer allowed Lisa an opportunity to show the autonomy of her position as a writer in a collaborating group:

> I couldn't have done that [become a better writer] without my group. We laughed, we fought, we grumbled, and sometimes we even sloughed off, but we learned more from each other--or, at least I learned more from them and I hope they learned from me--than I ever did in a lecture class where we just handed finished papers in. When you told us on the first day that we were to think of ourselves as writers in this class [rather than as students writing], I thought you were pushing it too far. But, from working with my group I do think of myself as a writer now. And I see the world differently.

Notes

1. A detailed report on this study, sponsored by the NCTE Research Foundation, has just been completed. Entitled "Collaboration: See Treason--A Three-Year Study of Collaboration in Freshman Composition Classrooms," the report is available by contacting the author of this article.

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MAKING CONNECTIONS: MINORITIES AND COLLABORATIVE LEARNING

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Collaborative learning groups with a multiracial or multi-cultural blend of students involve the participants in the learning process and expose them to contrasting formulations of knowledge and understanding. Different communities, whether of race or culture, have different knowledge, different conventions, different "truths." Exposure to new ideas and perspectives will reduce ignorance of other cultures and races and ideally, eliminate prejudice.

Preliminary studies indicate that in addition to the benefits of collaborative learning, which include greater academic achievement and a more positive attitude toward the subject matter, multiracial and multi-cultural groups lead to significant increase in the number of cross-race and cross-ethnic friendships, and fewer instances of interpersonal conflicts between different ethnic groups. But the administration of a collaborative setting with multi-cultural groups requires an understanding of the different interactive styles of the different cultures or races, and this must be accounted for in the structuring of activities, such as selection of topics, division of the students into groups, and establishment of expectations.

I. Introduction: The untapped resource

We believe that multiracial, or multicultural, collaborative learning groups can involve all students in the learning process, utilizing the resources of diversity in our classes. First, we'll discuss why we need multicultural learning groups--the theory and assumptions which inform our presentation. Next, we will summarize research on multicultural collaborative groups and discuss what problems might arise in these groups because of cultural differences. Then we'll describe what you can do to make multicultural collaborative groups successful in your classes.

II. The theory behind multiracial collaboration or, "everything is relative"

We are making two assumptions in our presentation: first, that knowledge is socially determined; and second, that prejudice is born of ignorance and unfamiliarity. The first assumption, the social determination of knowledge, is based in the history of science and philosophy over the last century. Once "knowledge," or "truth," or "meaning" was considered absolute and external to the self. Initially, absolute truth came from God, or from those who had direct links to God--divine right or divine inspiration. Then mathematics became our standard of truth. It was unchanging, provable, absolute. The fields closest to mathematics, the sciences, shared in this authority. Other fields tried to gain authority by defining themselves as "sciences," too--the social sciences. Since truth was absolute and external to the self, it could be learned. Teachers gained authority through extensive knowledge. Then they had merely to impart this fixed and unchanging knowledge to students, who learned to reproduce it as closely as possible--a method Paolo Freire has called "the banking concept of education." Students were receptacles used to

store information. But, as Kenneth Bruffee and others have noted, then came Einstein with his theories of relativity (1981a, 1984). And Heisenberg with his uncertainty principle. And Goedel with his statements about mathematical truth. And we were cast headlong into the age of relativity, whether we liked it or not. As Einstein discovered, things we consider "absolute"--space and time--change depending on the perspective of the observer. Heisenberg stated that the mere act of observing certain phenomena changes them. You can never know what would have happened if you had not been there to observe events. And Goedel stated that no system--not even mathematics--could be validated from within itself. For us, "meaning" "knowledge" are no longer absolutes. What we observe, what we see as truth, depends upon our perspective, our relationship to thing we observe. In other words, today, everything is relative. So, what do we consider "true"? Thomas Kuhn, in *The Structure of Scientific Revolutions*, described how "truth" in a scientific community is determined by consensus: it's true because we've agreed to view it that way. Lev Vygotsky, in his studies of language, described how we determine the meaning of words the same way--by negotiating among ourselves.

So different communities--races, cultures--have different knowledge, different conventions, different "truths." Because truth is relative--it depends upon your perspective--you cannot say one community is superior to another, that one perspective is "right" and another "wrong." Since knowledge develops in a community, it makes sense to use small communities--collaborative groups--in the learning process.

But why use multiracial groups? To facilitate growth and change. You see, *new knowledge*, new ideas and perspectives, enter a community through contact with other communities which have different "rules, assumptions, goals, values, or mores," as Bruffee put it (1984, p. 648). When we put people from different cultures into the same collaborative group, we get a mixing of minds, a combination of many different perspectives. We get what Richard Rorty has called "abnormal discourse." In abnormal discourse, the meaning of and assumptions behind the discussion are being continually challenged by other cultures. And that challenges our students. It stimulates them to think in new ways, to try new approaches to tasks.

It also challenges many of their assumptions about other races and cultures. That's where our second assumption comes in. We believe prejudice is born of ignorance and can be reduced through increased familiarity. There have been a number of studies to determine whether multiracial learning groups can learn not only how to view the subject matter of your course in new ways, they can learn how to get along with each other. It's not as simple as pouring equal measures of, say, black and white students into a group, blending briefly, and then waiting while the group rises to your expectations, however. Communication problems can also arise from the cultural differences and make the group fail. Those are the issues we will now address.

III. Collaborative learning across ethnic groups--research

Research on cooperative learning can be grouped under two general headings: those studies which used a peer tutoring technique, and those studies which used a group investigation method. Both methods emphasize students helping students, and both foster peer cooperation and assistance within the classroom. Research on collaborative learning has traditionally looked at changes in three variables: academic achievement, social affective attitudes and ethnic relations.

Findings:

While the results of this research is somewhat mixed and inconsistent across studies, several findings are consistent enough to warrant consideration.

Achievement variables:

When we consider changes in achievement we find that:

1. Greater academic achievement is demonstrated on subject matter which require higher cognitive functioning, mathematics, language arts, and reading. Students perform better on logic and verbal reasoning tasks; on high-level questions and questions requiring elaboration and expansion of responses.
2. Greater academic achievement is demonstrated when team reward rather then individual reward is used.
3. High-ability participants consistently out-perform their counterparts who are in competitive and individual learning situations.
4. Minority students in a collaborative learning environment show significant gains in achievement even when white children show no significant gains.

Affective variables:

Participants in the collaborative learning setting show:

1. a more positive attitude toward subject matter
2. greater mutual concern and group cohesiveness
3. more positive relations with peers
4. more helping behavior toward peers
5. more altruistic and cooperative behavior and less competitive and selfish behavior, and often
6. these cooperative behaviors and positive attitudes transfer to members outside of their team or group

I must warn, however, that some research suggests a "selective bias" effect, i.e., in between-group competition, group members may develop positive attitudes only toward peers within their group and attribute negative characteristics to persons outside their group.

Ethnic variables:

In general both methods produce similar results, i.e.:

1. significant gain in the number of cross-race and cross-ethnic friendship choices, helping choices both in assisting others and being assisted is reported.
2. this research reports fewer instances of interpersonal conflicts between different ethnic groups.

We have given you only a brief overview of the research on cross-ethnic cooperative learning. Some inconsistencies are presented in the research. Many questions need yet to be answered. We have only limited information on the long term effect of cross-ethnic cooperative learning on attitudes. Research to date has been limited to short experimental periods within the participant's total school curriculum. We don't know what would happen in one's entire school curriculum were based on a cooperative learning format. We do know however, that cooperative learning leads to higher achievement and increased positive attitudes toward group members in BOTH homogeneous and heterogeneous groups.

IV. Problems in cross-racial groups

We have alluded to the interpersonal difficulty often seen in multicultural classroom in which Anglo-Americans are the majority. What is the problem? And what if anything can be done about it?

The problem:

The problem in getting minority students to participate fully may stem from the fact that they come from a very different culture than that of the majority student; consequently, they may perceive the classroom environment as hostile or at best nonconducive to meaning interactions. Thus the minority student may feel self-conscious and reluctant to interact. Because African Americans and Anglo-Americans live in the same country, speak the same language (for the most part), and sometimes share common values, teachers tend to assume that these groups understand and share a common set of rules for social interaction. How wrong we are in making this assumption.

Critical incident:

Let me share an experience with you that emphasizes most vividly how culture influences classroom behavior. This incident actually happened to one of us, as a doctoral student here at Indiana University.

It happened in a language class. Let me set the stage for you. The responsible professor was away at a conference (a visiting professor from the same department was in charge), the topic was an issue on which she had very strong feeling. A young man (Canadian) held equally strong opposite views. During the discussion we became engaged in a quite energetic argument. For the most part, other class members listened, only one or two choose to participate in the discussion. When class ended, she felt that she had participated in one of the most meaningful, academic experiences of my entire program. But when the professor returned she was informed that the students were upset about the behavior demonstrated, she reportedly had been attacked by the male student, and a number of students had expressed a desire to drop the class. In essence she was told to behave myself, to not let this happen again. The male student, likewise was chided for his behavior. He assumed that she had complained to the professor. What we had "IN LIVING COLOR" was an example of how culture influences in interactive styles.

As we have previously stated, "It's not as simple as pouring equal measures of, say black and white students into a group, blending briefly, and then waiting while the group rises to your expectations." To increase the probability of the group rising the your level of expectation you must recognize, understand, and appreciate inherent differences between and among group members. And you must structure the groups to accommodate these differences. Here are a few things that you must consider.

It is well documented that African Americans have a cultural specific method of organizing and processing information, which fits what Dyke described in 1972 as field dependent perception. The field sensitive person prefers intuitive rather than deductive or inductive reasoning; seems to approximate concepts of space, number, and time rather than aiming at exactness or complete accuracy; prefers to attend to people stimuli rather than nonsocial or object stimuli; and tends to rely on nonverbal as much as they rely on verbal communication. While the first two observations are important, it is the last two that are more problematic in multicultural collaborative learning settings. For often, it is these two factors that create reluctance to participate, and breakdowns in communication.

To set up a meaningful collaborative learning setting, teachers must recognize differences in interactive styles and be sensitive to their effect on the interaction. (Look at Christine Bennett; *Teaching Students as They Would Be Taught*) Teachers need to know that:

1. African Americans define the lines of cooperation and competition differently. School is work, and work requires cooperation. On the other hand, sports and athletic endeavors are play, and play requires competition.

2. The speaker-listener relationship is different. The rules of participation in group discussion are different from those of the majority population.
    a. turn taking rules are different
    b. rules which govern deference are different
    c. rules for interaction in cross-racial settings are determined by the African-American/Anglo ratio

3. African Americans use words differently; the style of delivery is as important as the word itself.
    a. we seldom discuss, rather we argue; we argue to prove a point and we argue to vent hostility. Both forms are equally energetic.
    b. African-Americans don't view opposition necessarily as divisive.
    c. There is no separation of the provider of information from the information being provided. Therefore, it is extremely difficult to defend or support a position for the sake of discussion. For the most part, African Americans consider it is a waste of time to discuss or argue an issue on which one does not have a definite conviction.
    d. emotion and reason are not mutually exclusive; emotion is not viewed as negative; emotion does not necessarily interfere with one's ability to reason
    e. self-control is defined differently.

It doesn't take a rocket scientist to see how these differences can stifle effective interaction. So what can we do to maximize the probability of effective interpersonal interaction across racial and ethnic groups in collaborative learning settings?

V. Considerations in cross-cultural collaborative learning

Topic selection:

1. Must be relevant to all group members; group members should feel the importance of the issue.

2. Choose a topic on which consensus is not necessary and diverse views or approaches are expected or welcomed.
    a. topic should be complex or ambiguous enough so that there is not just one way to do it.
    b. topic should be one for which the parameters can be defined as broadly or as narrowly as the group warrants

Group selection:

1. The group should be small enough to manage easily and large enough to include diversity
    a. consider the time factor; it can take longer for larger groups to meet.

b. problem type or complexity; if students are just reading each other's papers, a large group can take a lot of time; if the problem is complex and students have a lot of time a large group may be better.
c. group dynamics; ideal group size is 3 -7; be careful in multicultural groups; small groups have less diversity; even number problem with people pairing up with each other; maybe 5 is an ideal number depending on the task.

2. The group should be formed with individual interests, differences (gender, culture, personality, etc.) and skills in mind.
   a. know your students (have individual conferences if possible) prior to making group assignments. If you have a large class, you will have to train your A.I.s to help with this
   b. you may want to set up temporary groups for in-class work during the first few weeks of class to see how students work together. You may formalize some of these groups later.

3. The group should be altered if it proves dysfunctional.
   a. we're making a political statement. We're saying that the teacher should assert authority rather than allowing the students to choose their own groups, because we don't want the students to pick the people most like themselves. There is a way to combine the two:
      1) have students rank their preferences for topics and then you (the teacher) form the
      2) form the group yourself and then let the group choose from a list of topics.
      3) both methods give deference to student interests.

Training:

Training should include:

1. a session on different social interactive styles
   a. encourage and welcome variety and diversity; let participants know that diversity increases their options; take all comments seriously, no matter how unorthodox they seem.
   b. encourage persuasive argument and discussion.
   c. accept both intuitive and logical approaches, but encourage the provider of the information to support any argument with evidence.

2. monitoring group behavior and providing feedback. Points to consider: .
   a. who is doing the speaking?
   b. what type of intercourse is taking place?
      1) giving information
      2) seeking information
      3) supporting
      4)contradicting, etc.
   c. are all participants contributing; if not, why not?
   d. are experts and special skills being used to facilitate participation without dominating discussion?
   e. are members getting equal time-equal voice-equal responsibility in the project?
   f. what group roles are members developing?

3. practice in effective interpersonal interaction. Group members should learn to:
    a. Show concern and respect
        1) Find something positive to say.
        2) Use probing questions to encourage expansion of one's perceptions and foster taking the point of view of another.
            i. have you considered or thought about . . .
            ii. what do you think would happen if . . .
            iii. how will this effect . . .
        3) Use non-critical, non-judgmental language.
            i. I'm a bit confused about . . .
            ii. I don't quite understand why . . .
            iii. I'm not sure . . .
    b. Provide honest feedback concerning their feelings, perceptions and beliefs, and ask for confirmation.
        1) They should frequently repeat what they think they have heard.
        2) They should summarize information, especially controversial statements.
        3) They should ask for repetition and clarification.
        4) They should let members know they respect each other's opinions, even if they disagree.

Product:

So that the final product will represent a group effort, the group should:

1. Assign each group member a specific responsibility.
    a. Each member must verbalize her responsibility.
    b. Each must ask for feedback from group regarding his understanding of the specifics of these responsibilities.
    c. Each must make periodic reports on progress to the group and instructor.

2. Utilize the skills of all group members.
    a. Encourage members to question and critically examine all information, even that provided by the specialist or expert.
    b. Emphasize that special skills do not translate into final authority.
    c. Be careful to avoid the "limiting effect" often caused by special skills or expertise: i.e., over-reliance on the opinion and/or leadership of the "expert."
        1) expert speaks last
        2) expert questions rather than tells
            i. questions should be open-ended
            ii. questions should be nondirective

3. Require evaluation and approval of all parts by all group members.
    a. Each member must see each part of the project.
    b. Each part of project must be critically examined.
    c. Dissenting opinions must be recognized and expressed formally.

4. Recognize that there is no single final authority.

Evaluation:

Goal: To provide feedback on both the product and the process

1. Evaluate the process.
    a. Require regular progress reports
    b. Require members to evaluate group interaction
        1) participation
        2) leadership
        3) cooperation
        4) respect for others

2. Evaluate the product.
    a. Grade the group, not the individual
    b. Look at the breadth and depth of investigation, not simply the conclusions reached

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STUDY GUIDES, NON-TRADITIONAL TEACHING, AND NON-TRADITIONAL STUDENTS

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Study guides provide an effective means of communicating goals, clarifying material, and supporting the student, thus making time available for innovative classroom activities. Course objectives are clearly communicated. Improved control of resources is possible. Study guides encourage student collaboration through study groups and related activities. Students surveyed indicated their overwhelming support for the use of teacher-prepared study guides.

Study guides provide an effective means of communicating goals, clarifying material, and supporting the student; thus, making time available for innovative classroom activities. In themselves, study guides function as a method of collaborative learning and as a means by which to encourage it.

Both teachers and students share the shortage of time to accomplish the diversity of demands placed upon them. This is particularly a problem for the increasing population of non-traditional students. Preparation in order to facilitate the most efficient utilization of study time is crucial to academic success. While the individual study skills of the student and the amount of quality time devoted to the subject make the greatest contribution to successful learning, improved direction and course organization communicated to the student can substantially increase the quality of study time and alleviate some of the tedium of the classroom.

Not all of the information and understandings that are instructed can be adequately internalized during the class sessions. For this reason, assignments are necessary. The nature of these assignments can be enhanced to benefit both the student and the teacher. Published study guides supplemental to a text or a teacher-prepared study guide to supplement a course are options for enhancement. The published study guides offer the advantage of convenience; however, the quality of the material varies remarkably. While sharing many of the advantages and disadvantages of the teacher-prepared study guide, they are not generally as beneficial as the teacher-prepared study guide and often not as intensely used by the students. Whether classroom materials specific to the course are distributed separately or collated in installments or volumes, word processing and modern copying techniques have changed the task of preparing materials for classroom use. No longer need a teacher type an exercise on a ditto repeatedly during a semester or proofread copies if a secretary's services are available. The original manuscript can be magnetically stored for repeated retrieval and copy generation and corrections or changes added without complete retyping. Multiple dittos may easily be printed or made on a thermofax machine or photocopying techniques may be used to reproduce the original. The previously required regeneration time can be put to better use.

Advantages

With these improved production methods, teacher-prepared study guides become a feasible classroom tool by which many goals may be accomplished. Course objectives are more clearly communicated, because materials are tailored for the course. Few teachers follow a text exactly. Areas may be emphasized or de-emphasized and additional information included. These idiosyncrasies can be communicated in a teacher-prepared study guide. It may be used as a guide to course content and structure, providing a focus, while improving direction and organization. Behavioral objectives can be communicated, both directly and indirectly. Whether or not the statement, "The student will . . . " appears in print, the presence of material pertinent to a topic indicates significance. Course goals and expectations can, thus, be demonstrated and reinforced through correspondence between this text and examination content, thus, aiding learning and facilitating goal achievement.

The teacher-prepared study guide offers improved resource control. Material tailored to the class allows inclusion of local examples and adaptation to the student population. In a laboratory course, the resources available to the teacher may not correspond to published materials. The teacher-prepared study guide offers the opportunity to provide information or questions appropriate for the available specimens, supplies, maps, or equipment. with a teacher-prepared study guide, a control of the available material exists. Access to information and material may be guaranteed, and all students have equal access. Supplemental source materials will not be checked out or stolen from the library. An omitted definition may be supplied, correct spellings indicated, or material updated. Since the material is there in print, the responsibility for the content is passed on to the student.

Study guides facilitate efficient use of valuable and limited class and study time. Important and beneficial materials may be provided and need not be hand-copied during the lecture. Dispersed information can be combined into one source. Retrieval time then becomes study time. Course materials originally distributed in class may be contained in the packet to assure that everyone receives them, even if absent from class, or that the copies are of acceptable quality, not those haphazardly run in mirror image or on short paper rather than legal size although submitted to the office days in advance but returned minutes before class. Additionally, distribution time and trouble is minimized, decision between reading the text or using the study guide. It may make study time more efficient but demand more of it. Some may try to short cut the learning process by copying from previous students rather than working through materials. Their usage alters behavior patterns. When they are not studied, more problems result as the standard deviation in the class increases. Some students become resentful as they see that they could have done better if only they had better applied themselves. The teacher is not as apparent a scapegoat. Furthermore, old habits are hard to adapt. After announcing that the water vapor capacity table would be supplied when needed for calculations but that several important generalizations were to be recognized, many students frantically added it to their guide in which it could be found four times. In the end, students come to expect that the teacher will prepare these guides for every course. Extensive organization is a fundamental and crucial prerequisite to the preparation of teacher-prepared study guides. Experience in managing course time is needed. Lesson plans must be completed before each unit can be written. The course must be structured and planned before the students have been met, while flexibility is limited by the materials and decisions made beforehand. Therefore, several years of teaching experience with similar courses are probably required to accumulate the organization skills and knowledge needed to prepare a study guide.

Student responses

Four different courses were asked to comment about their teacher-prepared study guide. One student said, "I think your study guide is wonderful! I feel I can listen more in class with the outline already in front of me and not worry about writing everything down. It is essential to survival in this class. Without it this class would be extremely difficult and I don't think I would learn as much without it." Another responded, "I like the study guide. It gives me an idea of what will be on the test. If you just said, "Read Chapter 2," I wouldn't know exactly what information in that chapter would be considered important. With the study guide, I can sort of do a "practice test". Also, the study guide explains some things, that I may not have gotten from the notes." Another declared, "I think that a study guide is a useful and essential form of learning the material. . . . I feel like I know the material inside and out, which means I could take the same test in a month and get nearly the same score. . . If I can work the guide I can pass the test." One student reported, "Any study guide is a definite help. In (your other class) I did not use guide for first two tests. The second test nearly buried my GPA. I started using the study guide and brought my grade back to a B+. (I just missed an A-). The study guide would have allowed me an A." Another student voiced the consensus and a problem. "I think the study guide is very helpful. I wish more classes had them! However, I do find it hard to come up with the amount of time that must be devoted to it." Someone else replied, "They must take a tremendous amount of time for the teacher to prepare. This enables me to follow along with the lecture and for easier study for test material." Of the seventy-nine responses, only one was not in favor of the study guides. She said, "I do not think it is worth the effort for the instructor to prepare study guides, although the study guide for this course was very adequate. Most students feel that studying the book and in-class notes are sufficient study materials." The responses showed total disagreement with her final statement. A number of students responded similarly to, "I would like to see more instructors use study guides such as this." or "I love your study guide, I would have died without it."

Conclusions

A common problem faced by teachers is "How can we teach all that we must?" Coverage of the material does not insure awareness or comprehension. A study guide improves the focus and encourages collaboration through study groups and discussion of discrepancies in answers and other student involvement activities. It expands the options available in the classroom and supplies support to both traditional and non-traditional students. Seventy-eight of seventy-nine students indicated that study guides were worth the effort. Their opinion is not the only one to be considered because it is the teacher that makes the final decision. Each teacher must consider their teaching methods, objectives, and priorities before deciding if teacher-prepared study guides would be feasible for their own classroom at that point in time. While teachers wear many hats in performing their duties, study guide preparation is not one of the expectations. The goal of a teacher is to promote learning. Study guides are a non-traditional method by which to further this goal. A dedication to the profession is indicated by a teacher that decides that the voices of the multiple students out weigh the disadvantages and, therefore, undertakes the effort to produce a teacher-prepared study guide.

USING COLLABORATIVE LEARNING TO HELP PROMOTE CONCEPTUAL CHANGE IN SCIENCE

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Recent research in education has established that students come to the study of science with definite ideas about how the natural world behaves. These alternative conceptions have been found to be highly resistant to change. Students may memorize the correct answer for an exam, but if they are asked about the same idea with the question phrased in terms of their everyday knowledge, they will reveal that the alternative conceptions are still in place.

Techniques of collaborative learning are very useful in encouraging conceptual change. The instructor designs collaborative learning tasks that require the students to identify their common sense ideas about the behavior of a system. The students then compare their answers with those of their peers, and they must work in a group to arrive at a consensus about the right answer to earn extra credit points. The students' ideas are thus challenged by their peers, rather than by the instructor. When they are challenged in this way, the students must muster arguments and evidence to defend their ideas and seriously consider the alternative ideas presented by their peers. This forces the students to engage in thoughtful consideration of their ideas.

Introduction

Recent research in science education (Driver, Guesne, and Tiberghien, 1985; Osborne and Freyberg, 1985; Eylon and Linn, 1989) has established that students come to the study of science with definite ideas about how the natural world behaves. Many of of these ideas disagree with the accepted scientific conceptions. These alternative conceptions are built when the student interacts with the world and his/her peers as he/she grows. The students are often unaware of these ideas, even when these alternative conceptions directly conflict with the material they are studying in the course.

Many of these alternative conceptions have been found to be highly resistant to change. That is, students will begin their study of a particular topic with these alternative conceptions in place, they will study the topic--and many of them will perform quite well--but if you wait for several weeks after they have finished the study of the topic and then post test them you will find that most of the alternative conceptions are still in place (White, 1988). The nature of the questioning used to identify the alternative conceptions varies somewhat from what is normally done in science classes. If the students are asked "science" questions they will often answer them correctly. However, if they are asked about the same idea but the question is phrased in terms of their everyday knowledge, rather than what they have memorized for the course, they will reveal that the alternative conceptions are still in place.

If a science instructor wishes to have a permanent effect in his/her teaching, these alternative conceptions must be modified. Or, at the very least, the modification process must be clearly initiated. How can this be accomplished if the students are unaware of their

common sense beliefs and those beliefs are strongly held? This is where collaborative learning can be useful.

Structure of collaborative learning tasks

In these collaborative learning tasks the instructor first hands out a one page task to each student. The task format used is called a ranking task (Maloney, 1987). In these tasks the students are shown eight variations on a situation and asked to rank these on some specified basis. The tasks require the students to decide how to use the given information and then apply that procedure to determine the relative ranks of the eight variations. The tasks also require the student to explain his/her reasoning. These tasks are especially useful for this type of activity because there are no clues in the task to help the students decide how to use the given information, so the students are forced to rely on their own reasoning. A sample item is shown in Figure 1.

Figure 1

Shown below are diagrams of situations where carts, initially moving along a horizontal surface, run up onto inclines. The carts go up the inclines until they stop. (The carts are not self-propelled.) All of the inclines have the same angle, and they are long enough to allow all of the carts to go until they stop. The masses of the carts, and their speeds at the Atom of the inclines are given in the figures.

Rank the situations in order of how high the carts go on the incline. That is, order the situations from the one where the cart goes highest (greatest vertical distance) to that where the cart goes lowest.

Highest 1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____ 7 ____ 8 ____ lowest
All carts reach the same height. _____
Please carefully explain your reasoning. _____
_____
_____

How sure were you of the reasoning you used? (circle one)
Basically guessed _____ Sure _____ Very sure
1 2 3 4 5 6 7 8 9 10

The students are given five to ten minutes to work the task. Then the students are placed into groups of four to six with the instruction that they must come to a group consensus about the answer to the task. Each group must choose a spokesperson who will report the group's decision to the whole class.

When they are placed into the groups they obviously have already thought about the task. In the group the various ideas the students have are identified. (The tasks chosen for these collaborative activities are ones for which the students can be expected to have several different ideas.) Each student in the group then has to think about his/her own idea in relation to the ideas of the other members of the group. In addition they have to think about how what they are studying relates to the task under discussion.

Each group has to work out how to decide what the group's answer should be. Since these exercises are often used as extra credit opportunities, where it is only the group's response--not the individuals' responses--that earns points, the students have a definite interest in the group getting the correct answer. Any student who wants to have the group use his/her answer as the group's response must convince the other members of the group of its correctness.

When the groups finish their deliberations the whole class becomes one large collaborative group. Each group's spokesperson reports to the class what they have decided and why. The groups defend their positions and challenge the ideas of other groups. The instructor directs the discussion to bring out implications of each idea and ways to test them, as well as making sure the correct answer gets serious attention. At the end of the period the instructor will normally identify the accepted answer.

Rationale (goals) for collaborative learning tasks

The collaborative learning tasks described here have a very particular structure. This structure is used to address explicitly the two aspects of alternative conceptions identified above. These tasks are designed to first of all put the students into a situation where they are explicitly required to identify their common sense ideas about the behavior of a system. Then they are placed in a group where they are confronted with the ideas of their peers. Since their peers' ideas will often differ from their own, they must decide whether or not to try to defend their own idea or adopt one of the possibilities being presented by their peers. If they decide to defend their own idea they must think about why they believe it, why they do not accept the ideas being presented by their peers, and how they can effectively argue for their ideas. But the fact that their ideas are being challenged by their peers, rather than by the instructor or the text, is very important.

The requirement that the group come to a consensus forces them to seriously consider each of the ideas being presented and the arguments and evidence supporting them. They have to do this in a situation where the "right" answer is not known. (They are not allowed to use their books or notes, and these tasks are usually done before we have studied the topic very thoroughly.) If the instructor has also alerted the class to the fact that people develop alternative conceptions about how systems behave as they mature, and that there is no correlation between intelligence, aptitude, or intellectual ability and believing such alternative conceptions the students will not automatically accept the answer the "bright" member of the group produces.The active discussion this task context fosters accomplishes several important things. First, students' ideas are initially challenged by their peers, not by the instructor. This is extremely important because students can easily memorize the answer the instructor presents without modifying their own ideas, or even realizing that their

conceptions have been challenged. Students are used to doing this in order to survive in the courses they must take. But when their ideas are challenged by one of their peers they must muster arguments and evidence to defend their ideas and they must seriously consider the alternative ideas their peers are presenting. Both of these cognitive activities require that the students engage in thoughtful consideration of their ideas.

Second, the focus of the discussion shifts from "What's the right answer?" to issues of evidence and supporting arguments. This gets the students thinking about the particular knowledge in the task in a broader context. They have to think of what would constitute evidence for their position. They also have to think about what other ideas and principles are tied to the principles and concepts of this task.

Third, by presenting the student with several possibilities for how the system behaves the discussion puts the "right" answer in a different light. Now instead of being the only alternative to their idea, it is one of several alternatives. It also puts it in the position of something that will have evidence supporting it and that will fit into a larger knowledge framework.

Ways to use collaborative learning tasks

There are many ways to use collaborative learning tasks. I will mention only three here.

The collaborative learning tasks described in this paper are excellent ways to introduce a new topic. By presenting students with tasks where they have to predict the behavior of a system and then argue about it among themselves you accomplish several things. You make it clear to the students that they do have ideas about what they are about to study. You get them interested in the topic because they have something invested in the topic now. And you enable them to discover that other students have different ideas, and can use the same evidence to support a different position.

These tasks are very good extra credit quizzes for especially difficult topics. By having the students work together, the chances of the group working out the correct answer are greatly improved. Since the tasks are extra credit quizzes, the groups that do not get the item correct do not lose anything by the exercise, and they have engaged in critical thinking about the issues.

These tasks can also be used to help students learn problem-solving skills. Students cannot learn to solve problems by watching someone else solve problems; they must actively engage in problem solving. On their own many students quickly get frustrated trying to solve problems. However, In collaborative groups different students will come up with useful ideas at different times so the process does not bog down as often. Students learn a lot about problem-solving by being a part of the successful solution of these problems.

Advantages of collaborative learning

Several of the advantages of collaborative learning activities are especially important for science course that have a goal of promoting conceptual change. One is that collaborative learning can help foster a sense of community in the class. Tobias (1990) has recently argued strongly that lack of any sense of community in science courses is one of the major reasons many students are turned off by science.

A second very important advantage of collaborative learning tasks is that they foster active reasoning with the concepts and relations under study. Students are forced to think about the ideas and relations from several different perspectives rather than simply memorizing them. And the students also have to think about evidence and reasoning that could be used to convince others of the correctness of the position they are defending.

Collaborative learning activities allow students to ask questions they might not ask in class. These activities also provide students with an opportunity to explain something to someone else rather than just listening to a lecture. As any experienced teacher knows explaining something to someone else is one of the best ways to learn it better yourself.

Related to the two advantages just mentioned is that students identify other concepts and ideas that they have linked to the concept under study. This helps them realize that concepts are not isolated pieces of knowledge, but rather part of a connected framework.

Finally these activities help the students realize they can accomplish more than they think they can, even in science. Altering the students' attitudes toward their own abilities in science can be extremely important in that it can help them to engage in thinking about science at other times in their lives rather than avoiding science.

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COLLABORATIVE LEARNING IN PHYSICS? IMPOSSIBLE! AND YET...

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Reacting to the complaints of physics majors and the failure of the program to attract majors in sufficient number, the Physics Department recently restructured its elementary course to include collaborative learning. The model of whole language teaching suggested the potential in having students learn physics by participating in the types of activities that are part of a professional physicist's daily routine. The restructuring of the program involved the creation of discussion sections where the students meet in small groups with a faculty member. In the small groups the students are actively involved in problem solving. Representatives of the small groups share their findings with the rest of the class, generating discussion. The responsibilities for the course are shared by two faculty members, whose collaboration in teaching provides a behavioral model for the students.

The faculty continues its interaction with the students through teas and colloquia, discussion periods, and departmental activities. The students learn that their contributions are valued. They sense the faculty's interest in and respect for their achievements, and they begin to think of themselves as physicists.

An evolutionary experiment is under way in the teaching of our calculus based introductory Physics courses here at Indiana University. The experiment involves certain structural changes in these courses. These structural changes invite substantive changes in our approaches to Physics teaching. A closer examination of our new approaches to Physics teaching shows a remarkable similarity to the language arts teaching philosophy called "Whole Language".

One component of this philosophy is collaborative learning. This paper discusses the collaborative nature of our experiment in teaching these elementary Physics courses. A fundamental rearrangement of priorities of the course establishes a structure with considerably more time for collaborative learning, both among students and between our students and ourselves. The results of the experiment are not yet in. However, as in all concerted efforts to improve a situation, the students and we share a sense of excitement about the outcome of this experiment.

Physics teaching

The physical sciences and Physics in particular are often sited as the prototypic example of non-collaborative, highly individualistic behavior, both in learning and in research. Physicists are seen as individuals who confront nature largely undistracted by their fellow scientists. They are recognized principally for their individual accomplishments. The revered scientific method addresses the interaction between the scientist as an individual and the world being studied. Information exchange among scientists is perceived to take place through the formal mechanism of publication of results in public journals.

The famous transmission model of teaching where professors expound and students absorb, is assumed to be the standard. In the classroom the flow of information is unidirectional proceeding from teacher to student. The elite scientists deigns to pass absolute truth on to the masses on the outside.

Though clearly an exaggeration the above picture is not terribly far from our view of Physics teaching of a few years ago. This view is rapidly disintegrating and is being replaced by a far more collaborative view of learning and research. On careful examination we see that physicists routinely collaborate in research and we hypothesize that collaboration is fully appropriate in Physics education. Our experiment in elementary Physics teaching is an effort to test this hypothesis.

The whole language grounding

On an airplane flight a few weeks ago I was watching a two year old "kid" playing with the plane's window shade next to his seat. The shade went up and down, first slowly, then faster, sometimes pushed with one finger, then pulled with two hands. He was enjoying the change in light the shade created, the sound it made, and the effect on others in the plane. The kid was persistent and noisy and quite intense.

Two weeks earlier my wife, Cynthia Brabson, a whole language professor at Hanover College had put in my hands another book on whole language by Harste, Burke, and Woodward called "Language Stories and Literacy Lessons". In it the Indiana University trio discusses scribbling kids do. Their research convincingly demonstrates that this so-called scribbling is part of an enormously rich language learning experience. Writing is already going on, even before a child knows the letters. These scribblers are learning to write by writing.

Two things then occurred to me: first, that perhaps my kid on the airplane was already a scientist, and second that perhaps we in Physics, in our efforts to understand how to create scientists, should look to our colleagues in whole language. They clearly are understanding how to create a writer. But, you may ask, certainly children must do many work sheets on making letters before they are writers. And then I thought about (and rejected) the idea of making the kid on the airplane do a work sheet on airplane shades before experimenting with them.

The question then becomes whether we physicists dare collaborate with our academic cousins in whole language in a potentially rich exchange of ideas. Can we tap their developed wisdom? For fun I wrote down a few thoughts from whole language and made the following replacements. Where ever they said "reading" I inserted *observation*; for "writing", I inserted *experiment*, and for "language," I used *science*. Try it on the next three paragraphs.

A bit of whole language (now whole science!):

1. Whole language teachers know that children learn to *read* and *write* by *reading* and *writing*, so they give children a predictable time and opportunity to do a great deal of both. The curriculum is *language* filled. *Writing* is a creative act.

2. Whole *language* teachers utilize collaboration in creative and generative ways in the process of helping children to become *readers* and *writers*. Collaboration and *language* fit naturally together. Teachers of *language* are students of *language*, and students are teachers

in a non-threatening *language* environment. Risk taking is encouraged in this whole *language* environment. Children's ideas are valued. Knowledge is socially constructed.

3. The whole *language* teacher has a child centered curriculum. Children take ownership of their learning process when they are involved in the direction of that process. The process itself becomes more important than content. In whole *language* children are welcomed into the community of *readers* and *writers*.

The physics courses

Underlying our efforts to make major changes in the introductory physics courses were two things. First, the number of physics majors at Indiana University had been quite small, averaging some 10 a year. Second, in discussions with our majors, we heard three persistent complaints.

1. Our undergraduate curriculum was not experimentally based. Yes, there are laboratory courses, but the emphasis is on theory. (I recalled the emphasis in whole language on a curriculum filled with reading and writing.)

2. Our undergraduate curriculum was not collaborative. Students were not encouraged to work together, to teach each other physics. (I recalled that both in whole language and in our own physics research lives, collaboration is essential to the whole enterprise.)

3. Our undergraduate curriculum was not student centered. We often didn't even know our students' names. No discussions were held in class about careers in physics, about our research, and how our research might involve our students. Little attempt was made to bring our students into the life of our department. Their ideas were not valued.

Structural changes

We began with four changes in the mechanics of our elementary Physics courses. First, the format of the course was changed from four lectures a week to three lectures and two discussion sections a week for each student. The discussion sections are small. Second, two faculty now collaborate on the teaching of the course. Third, the number of physics topics has been reduced substantially, and fourth, calculus is now a co-requisite for the course, not a prerequisite.

Consequences of these structural changes

All of these changes help to provide more time to work collaboratively toward the common goal of creating physicists. I break the description of our collaborative efforts into three sections, faculty-faculty collaboration, student-student collaboration, and finally student faculty collaboration.

Time for Faculty-Faculty Collaboration:

Two faculty members are now assigned to these introductory physics courses. As an example of the social construction of knowledge, novel ideas and approaches to teaching physics have come from discussions among the faculty involved. Each part of each course is developed, coordinated, and reflected upon in collaboration. All aspects of the course receive the joint attention of the faculty including the progress made by each student in the course. New parts of the course can be attempted with joint enthusiasm and reinforcement. For example, new laboratory exercises are regularly developed. Even joint lectures become a possibility where students see their faculty as role models of collaboration in physics.

Time for Student-Student Collaboration:
Groups of two or three students are actively involved in problem solving during the small discussion sections. Half the class at any moment is teaching the other half. Each student becomes fluent in the language of Physics. Study groups are spawned in discussion sections and continue outside of class. Students bring different experiences to bear on common problems, and in the process begin to form collegial relationships with their fellow students. Uri Treisman's experience at Berkeley confirms the value of collaborative learning in areas such as Physics and Mathematics at university level.

From each of the small groups a presenter then outlines ideas for a larger group of students. These presenters begin to get experience in a more formal means of communication in Physics similar to presentations at meetings. They are asked to lead the discussion of ideas that emerge. Other students are then willing to be risk takers, entering the discussion. During these discussions students also do the hands-on physics demonstrations for their colleagues. As whole language students become writers by writing, our students are becoming physicists by doing physics.

The faculty members become collaborators and facilitators by roving from group to group asking questions and contributing ideas. They are no longer "experts" but rather learners and teachers with the students. Student ideas and approaches are valued and discussed and the venerable transmission model is no longer needed. The faculty then have time to concentrate on learning as much as possible about their students, their interests, their difficulties, their questions, and their capabilities. A student centered curriculum emerges.

Time for Student-Faculty Collaboration:
As soon as students begin doing physics in these introductory courses, they are doing the same things that physicists do, and can now begin to think of themselves as physicists. They are our collaborators in the enterprise of the creation of physics knowledge. In the newly structured courses there is time to bring them into the "thought collective" or family. There is time to discuss careers in Physics and the kinds of things they can do with a B.S. in Physics. We can convince them that, not only can they make useful contributions to the field of Physics, but also we badly need them in the field. Their ideas are valued and their contributions sought by us.

We can encourage them in this direction by inviting them to participate with us in all the things physicists do such as attending teas and colloquia, and getting together with other majors to discuss interesting Physics at places like the new Physics majors' room or the Physics Club. Discussion periods are ideal for discussing recent break-throughs in the field or current research you are doing. The students enjoy getting involved with department activities such as the Science Open House. There is time to read recent journal articles and discuss them in class, and even time to discuss summer opportunities for physicists like them. Of course, the extra time can be used to advantage to help individual students with a forgotten calculus idea or two.

Best of all we find as a faculty member that we have time to get to know our students well. This, perhaps more than any other thing, helps them to think of themselves as physicists.

Difficulties encountered

In a collaborative physics environment all is not sweetness and light. There are difficulties. I mention the most persistent ones here.

With two faculty come two sets of ideas about the courses. We have different ideas about the choice of topics, choice of laboratory exercises, pace of the course, and kinds of problems. (My response: Such a course takes lots of planning, talking and coordinating. The faculty time spent is as large as doing the course alone.)

Students sometimes play one faculty member against the other for grades. (My response: A clear delineation of final grade responsibility for each part of the course is needed.)

Some duplication of effort takes place. Regular meetings are needed, attending each other's lectures and discussions helps, and both must get to know all the students. (My response: It is worth the extra time.)

The lecturing person doesn't get to know the students as quickly as the discussion person. (My response: Switch back and forth often, perhaps once every two or three weeks.)

Students under pressure from less collaborative courses decide to exploit the system, letting others do all the homework for them. This can lead to their failure. I find 2-3 each semester who begin this way. (My response: Discuss this with the students whom you identify in this situation and keep a sharp eye on their weekly performance.)

Assigning two to a course is a highly intensive use of faculty. (My response: That's right, it is an intensive use of faculty. The Physics Department has decided that it is a good use of its resources.)

Students sometimes feel that it is a waste of their time to listen to other student's explanations when the faculty member's explanations are "better". (My response: This is a valid point. It needs study. However, in my experience, active learning ultimately lasts longer than passive learning.)

Student presentations take much longer than faculty presentations, so fewer problems or examples are "covered" in a discussion class. (My response: It does take more time. This is one reason that having two discussions a week is so valuable.)

Will such a collaborative technique, which works well with highly motivated Physics, Chemistry, Math, and Computer Science majors, work with students who are *required* to take a physics course to complete a requirement? (My response: Let's try it, and see.)

Summary

An experiment with our introductory physics course is underway. It is based upon certain structural changes including the use of two faculty members, two discussions a week, fewer subjects covered, and calculus as a co-requisite. These changes free time to substantive changes in the way the courses are conducted. The substantive changes are grounded in a philosophic view similar to Whole Language.

The time is being used in collaborative efforts between the two faculty teaching these courses, in collaboration among the students both in and out of class, and in bringing these students into our world of physics.

Anecdotal evidence of the success of the experiment is wide spread. As collaborators we and our students are beginning to understand how physicists are made.

THE CHEMISTRY LABORATORY: A SITE FOR COLLABORATIVE LEARNING

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Learning emphasizes connections between past experience and present problem, between those with much knowledge and those with less. Education is a collection of processes that require and promote the cooperative involvement of all segments of society. Yet collaborative curricula within higher education remain the exception rather than the rule. This can be attributed in part to the emphasis within our culture upon individual achievement. It can also be attributed to economic considerations; educating the largest number of students with the fewest resources has been given high priority.

One model for collaborative learning is the graduate research group, where members are focused on a collection of particular problems within a field, which serve as a shared challenge to all involved. Application of this model within the undergraduate chemistry laboratory results in a format where the students are given a series of problems to be solved during the term, with evaluation based on the planning, implementation, and reporting of their work. Such a setting fosters informal collaboration among students as they share ideas and information. Formal, structured collaboration occurs in a weekly session where the students report on achievements and difficulties and receive feedback from their peers and the instructor. Studies show that the use of collaborative techniques in college-level science classes encourages students to be active, creative practioners of science.

Introduction

Two questions appear to run as a common thread through situations that elicit learning: (i) "have other persons experienced this problem before?" (ii) "what has been their response?" Learning emphasizes connections, connections between past experience and present problem, between persons with much knowledge and those with less. Formal education provides opportunities for persons wishing/needing more knowledge to connect with the important repositories of knowledge and technical skills. It requires resources such as teachers, libraries, buildings and equipment that enhance interaction among persons, groups, institutions and information. Thus, education is a process, or perhaps more accurately a collection of processes, that requires and promotes the cooperative involvement of all segments of society.

If my observations are correct, collaborative learning,[1,2] "a pedagogical style that emphasizes cooperative efforts among students, faculty and administrators," should be the predominant style of learning/teaching in higher education. A basic assumption of this paper is that contrary to expectation collaborative learning most often occurs outside the formal structure of higher education (e.g.; lecture, teaching laboratory). Moreover, it is in fact, discouraged by much of current pedagogical practice, and is practiced by most students as an informal dimension of the curriculum.[3]

An important reason for the relatively minor role that collaborative learning styles play in contemporary higher education may be the emphasis within our culture on the individual and individual achievement. The human quest for distinction and recognition is readily apparent and universally acknowledged, and it must be partly responsible for the importance placed on evaluation of individual achievement and attribution of creative insight within our educational programs. Perhaps the tradition of the lonely scholar withdrawn from society has also contributed to the dominant style of academic programming. The notion of teacher/scholar as conveyor of knowledge via lectures and books has usually taken precedence over the Socratic tradition and others with greater emphasis on extensive, continuing interaction between learner and teacher.

Students and teachers bring different concerns and perceived responsibilities to a learning/teaching situation. These differences create barriers that separate rather than draw together participants in traditional classroom and laboratory courses. The teacher seeks to be a relevant source of information and experience, and skillful in transmitting that knowledge to students. Students, on the other hand, are encouraged to acquire knowledge from instructors' lectures, reading assignments, and computer-based exercises, then demonstrate their proficiency on examinations. Examinations become the principle focus of the course and render student-teacher interaction more combative and less supportive than both might regard as ideal. McNeal and associates[4] argue persuasively the merits of a non-competitive classroom environment for enhancing the appeal of science courses to women and minority students. This significant potential benefit has escaped our attention due to a paucity of experience with the collaborative style of learning/teaching.

Models for collaborative learning

An educational tradition that places a priority on sorting and rewarding learners on the basis of individual achievement cannot be expected to provide leadership in the design and implementation of programs that emphasize collaborative learning. Furthermore, the economics of education provide another important dimension to program design. Program efficiency, i.e.; educating the largest number of students with the least resources, has been given high priority. Thus, it is not surprising that there is a dearth of effective models for collaborative learning in the formats used to educate most students. The most obvious and most important model from my personal experience is the graduate research group. This special learning/teaching experience begins with the advantage of having all members focused on a specific field of inquiry and a collection of particular problems or projects within that field. The projects pursued by individual students or by teams of researchers present a shared challenge to research director and student(s). In this context all are truly learners. The problems to be solved or questions to be answered are considered important by all involved. Furthermore, there is a real sense of individual and collective responsibility for the success of the effort. A sense of competition, when experienced, is usually generated by influences considered external to the group, e.g.; priority of discovery, peer recognition, funding, laboratory space and other resources.

Several other learning/teaching formats could serve as models for designing collaborative learning experiences. The interdisciplinary course brings together content from two or more disciplines and the faculty representing those disciplines. However, the teaching/learning process may be operationally *anything but collaborative*. For example, the instructor(s) could use the traditional lecture format. A special topics seminar can provide the vehicle to enhanced collaboration between students and instructor. There can be

shared responsibility for course content and discussion leadership. The computer when utilized in computer-assisted-instruction permits new, multi-dimensional linkages among students, instructor and course content. The ability to link persons at different locations and subject to different schedule constraints makes the computer a valuable resource in implementing collaborative learning strategies. The traditional lecture and laboratory classes should not be summarily dismissed from consideration. In fact, spontaneous or planned interludes within the traditional lecture or laboratory course can offer opportunities for students to probe problems in a collective, mutually supportive format which may include the instructor as a participant learner. These transitory experiences can make a compelling impact on all participants. However, the focus of this paper is a model that maximizes student-student and instructor-student collaboration on a continuous basis throughout the course. It is my contention that an undergraduate chemistry laboratory program modeled after the graduate research group represents a highly effective example of collaborative learning.

Collaborative learning in the organic chemistry laboratory

Given the educational experience of most college and university teachers of chemistry, i.e., extensive participation in a research group, it is surprising that the "research group model" contributes so little to the character of undergraduate education in chemistry. As a young instructor, I decided to make the organic chemistry laboratory course as close as possible to a "research experience." The details of the program were reported many years ago.[5] At that time the principal motivating factor was the perceived lack of enthusiasm of students and sense of "wasted time" by instructor for the conventional laboratory program. This format was often referred to as a so-called "cookbook approach" and was based on a series of well-tested experiments carefully described in a required textbook. The students performed the experiments to the best of their ability and described their results in a series of written formal reports. Student grades were based on the amounts and purity of products, and the quality of written reports. Our course adopted a "problem-oriented" format in which the students were given a series of problems to be solved during the term. The problem series began with a very specific, easily perceived problem, i.e.; the identification of an unknown substance, and it usually ended with a mini-research project, of the student's design (if possible), and implementation. Evaluation was based on quality of experimental plan as well as its implementation and a written report that fully described the work. In the context of collaborative learning, the laboratory program was successful because it brought student curiosity and energy together with chemical expertise (text, research literature, instructor's knowledge and experience) on problems that were real and relevant to both student and instructor.Two kinds of collaboration were readily apparent in this program. Informal, unstructured collaboration began quickly and spontaneously between students who knew one another or were located in the same section of the laboratory. Ideas generated by students quickly spread when they appeared to provide helpful insight into obtaining information, interpreting data, or developing a strategy of investigation. Unfortunately, erroneous information was transmitted and exchanged with equal alacrity. Some students, but not all, quickly attempted to enlist the assistance of the instructor. In fact, some students sought the instructor's advice and suggestions for each small step taken in their work, and required gentle encouragement even firm directives at times to help them take charge of their problem or project. Frequently, the most effective response by the instructor to a student's question was a carefully framed question or group of questions that helped her/him develop an effective experimental plan. In the context of this program, lectures by the instructor on methodology, specific experimental techniques and basic fundamental knowledge were perceived by most students as collaborative. The

instructor was perceived to be sharing knowledge and experience that would help them with their problems. Far more discussion was initiated by students than I have encountered in any other learning/teaching situation. The text and library resources assumed the roles assigned to them by mature scholars. They provided insight and guidance to the student, but were often seen as lacking the detailed, specific information the student sought. In some cases, students found the literature to contain misleading, even erroneous, arguments and results.

The formal, structured collaborative element in the program consisted of a weekly session in which each student had an opportunity to report orally on recent achievements and difficulties. The criticisms, suggestions and encouragement of "peers" (other students and instructor) were shared in free-ranging, open, often vigorous, discussion.

Evaluative comments

I have found the "problem-oriented" approach to learning/teaching in the chemistry laboratory highly rewarding and intellectually stimulating. Student response has been mixed, but never lukewarm. Most students areextremely positive and acquire obviously high levels of skill as experimentalists. Some students are unwilling to make the requisite commitment of time, study, and reflection required to fully participate in all elements of the program as an individual or a collaborator. McNeal[6] notes that "introducing students to college-level science through active inquiry is both feasible and rewarding, but choosing to teach in this way entails abandoning broad coverage in favor of critical skills." Furthermore, she reports that the collaborative learning approach encourages, even requires, students to be active, creative practitioners of science, but in a non-threatening, supportive environment. The "problem-oriented" approach, however, places stringent demands on the instructor in terms of providing effective guidance and encouragement to students who lack confidence and experience in confronting scientific problems. The student/instructor ratio must be no more than 20:1 and preferably closer to 10:1 for an optimum learning/teaching experience. The evidence to date encourages a serious investigation of the problem-oriented, research group approach to learning/teaching.

Notes

1. This definition was developed by the American Association of Higher Education's Action Community on Collaborative Learning.

2. For a recent general introduction to important issues in collaborative learning see MacGregor, J., "Collaborative Learning: Shared Inquiry as a Process of Reform." In M.D. Svinicki (ed.), *The Changing Face of College Teaching*. New Directions for Teaching and Learning, no. 42. San Francisco: Jossey-Bass, 1990, pp. 19-30.

3. Here I exclude the obvious illegal, unfair, inappropriate examples of "collaboration" such as cheating and plagarism.

4. Woodhull (McNeal), A., Lowry, N., and Henifin, M. "Teaching for Change: Feminism and the Sciences." *Journal of Thought* 1985, 20 (3), 162-173.

5. Fife, W.K. "The Organic Chemistry Laboratory--A Problem-Oriented Program." *Journal of Chemical Education*. 1968, 45, 416-418.

6. McNeal, A.P., "Real Science in the Introductory Course." In F.S. Weaver (ed.), *Promoting Inquiry in Undergraduate Learning*. New Directions for Teaching and Learning, no. 38. San Francisco: Jossey-Bass, 1989, pp. 17-24.

COLLABORATIVE LEARNING IN LARGE LECTURES

Moderator: Jim Crowe (HPER/IUB)

Panelists: Leslie Bland (Physics/IUB)
Bernardo Carducci (Psychology/IUSE)
Craig Nelson (Biology/IUB)
LoriLee Sadler (Computer Science/IUB)
Janet Streepy (English/IUSE)

Jim Crowe
Department of Health,
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JC: This afternoon's presentation deals with collaborative learning, primarily under difficult contexts such as large lectures. My name is Jim Crowe, and I'll moderate the panel this afternoon. Each of our presenters will make a statement of somewhere between 5 and 10 minutes, and then we will have panel interaction. I will give a brief statement about our presenters, then let them begin. We'll start with Craig Nelson. Craig is a professor in the Biology department, and he has been with Indiana University since 1966. Next we have Janet Streepy. Janet is an Assistant Professor of English, and she is in charge of the writing program at IU Southeast. She has been on the faculty since 1984. Next we have Leslie Bland, an Associate Professor in the Physics department at IU Bloomington who has been here since 1984. We have LoriLee Sadler, and she's a Lecturer in the Computer Science department in charge of all sections of the course A200, which is a basic level computer literacy course enrolling about 600 students each semester. And finally we have Bernie Carducci. He is an Associate Professor of Psychology at IU Southeast, and he has been there since 1979. We'll start with Craig and take it from there.

Craig Nelson
Professor of Biology, IUB

CN: As I understand it, our focus is the question: "How does one use collaborative learning techniques in large lecture classes, situations that are traditionally teacher-structured?" It seems to me that there are two essential points. One of these is that you need to provide structure. We must help the students learn how to collaborate. We can't assume they're going to be able to collaborate without any preparation. The second point, at least from my point of view, is that collaboration will be much more helpful if you use it to help the students do things that they couldn't do by themselves, and structure the content so that they're asking questions that they couldn't ask by themselves. This semester I have a lecture of 85 students, and optimally, every 15 to 20 minutes I'm asking them to write down the most important point that they see in what we have just been doing, and sometimes to write down a question they have related to that point. And then the students share that with each other. On more difficult points, I have them working in groups of two or three to write down mutually the most important point and share it with each other. It seems to me that this achieves two or three kinds of things: it causes the students to focus on what has just happened, and it changes them from passive to active participants. Having them talk together lets them clear up each others' misconceptions, so a lot of mislearning is cleared up almost immediately. The energy of the class is much higher than

when they were just listening to me, and the question-level and interaction with me increases. That's one technique that I've been using. Another is a structured, small group discussion that takes about an hour and takes longer to explain than I have today. It involves having them do a worksheet in which they analyze an article before they come to class, breaking them up into groups of five or six, and helping them focus on roles so that no one is dominating the conversation and no one is withdrawn.

Janet Streepy
Assistant Professor of English, IUSE

JS: Like Craig, I find that it is very helpful to let students talk to each other and to write. Often when I introduce something new in the class, before I introduce it I ask students to take a couple of minutes to write down everything they know about that particular subject--often it doesn't take them longer than a couple of minutes--and then to talk to each other about it. I have found, too, in my classes, that to be able to turn to the person next to you and to talk for a couple of minutes is an energizing thing to do. Another strategy is to pass out questions that we are going to discuss ahead of time on a discussion sheet and ask students to add to it: and to ask students at times to discuss some kinds of questions in groups of three. Another thing that has been helpful is to ask students to construct examination questions. In a large group of students, students often feel isolated from the learning process. As far away from you as they are physically, they feel similarly far away from the content of the course. I heard a person this morning say that she asked the student to design the question, asked somebody else read the answer, and asked somebody else in the same class to evaluate the answer. I, too, use the discussion sheet that the students bring back filled out. And finally, I try to give no examinations that are multiple choice. I try to ask the students to do in the examination pretty much what we have been doing in class. I have given examinations that are discussion examinations, and they have worked better than I would have thought. I teach literature. The final has to do with a certain piece of literature that the students are assigned before the final exam, and during the exam they divide into groups and they talk about it. They get their discussion sheet ready, and then they talk about the piece of literature.

Bernardo Carducci
Associate Professor of Psychology, IUSE

BC: At Indiana University Southeast, I have been teaching every semester for the last ten years. In the summer, I teach the Introductory Psychology class. At our campus that's probably the largest class, enrolling between 90 and 100 students. Most of the students are at the university for the first time, so in addition to fostering collaborative learning you want to foster integration into the university and into the classroom. We have a class that's probably larger than the population of their town, and it can be a very frightening experience. What I try to do first and foremost is to make it very clear to these people that I want to be there and that this is not an assignment that has been given to me. It is, in fact something that I enjoy doing. I want them to know that this is not a punishment that I am enduring as a result of bad teaching or bad politics. Creating enthusiasm can foster a sense of friendliness that can make this environment less difficult. Another of the things that I do is try to show up ten to fifteen minutes early to each class. That gives us time to talk and answer questions and concerns they might have in five or ten minutes. Also, it gives me the chance to start on time so the students know that when it's 11:00, we're going to start. In fact, they come early because they know we are going to start early every time. So I think we're making the thing less threatening by making it predictable, letting them know

what to expect. Another way that I try to foster collaborative learning is to introduce this notion from the very beginning. I have developed a series of classroom exercises that can be done with groups as large as 100. The first exercise is called "Will Class Participation Kill You?" This is an exercise that teaches them about doing psychology experiments, and about the notion of hypothesis and hypothesis testing. An hypothesis held by the student is that class participation will kill them. My hypothesis is that it won't, and we precede to test that hypothesis; we design a little experiment. Basically what the experiment boils down to is speaking up in class. Everybody takes a turn doing that on the very first day of class to establish the norm of class participation. Plus, we begin to learn something about the way psychologists think. The second thing that I try to emphasize is not only to do it the very first day, but to keep it up. In the first couple of weeks in this class, we do lots of things that involve working together. Part of my research as an academic is in the area of shyness and social skills development, so for the last ten years, every fall or in every class we have passed out the "IUS Shyness Survey." The students go in groups to administer this to other people. The survey takes ten minutes, so we get out ten minutes early, they do this, they bring it back to me and we analyze the results for the next class period. We project them on the board so they can see that a lot of other people, not only in class but at the university, share this notion of shyness. The third exercise that I have developed has the nature of a scavenger hunt. This demonstration is called "Looking for Love," and it focuses on interpersonal attraction. Students break up into groups of five and they go out and look for certain determinates of interpersonal attraction that we've talked about and read about in the textbook. They compete in teams, and we see how quickly they can find or identify these things on campus. The group that gets this done first gets a hokey prize that we buy from the bookstore and they are declared the winners of the hunt. There are other kinds of things that I try to do, but this is a way that gets the students to at least begin working together in this kind of environment. And it's critical, I think, that you don't just do it once or the very first day of class, that you keep this up throughout the semester.

Leslie Bland
Associate Professor of Physics, IUB

LB: I've been involved in collaborative learning in an introductory physics course intended for physics majors and engineers. It is a calculus-based physics course, with an emphasis on problem-solving, so in fact, the intellectual content of the course, which is strictly Newton's Laws and some conservation theorems, could be summarized on the first day of class. What the students are confronted with is not so much learning lots of different pieces, facts and so on, but rather in the course of the semester, they're developing problem-solving skills. When the instructor does a problem on the board, it looks simple. Students understand what's going on, but it doesn't necessarily help them to go and confront new problems themselves. They don't really know how to take the basic physics knowledge that they're given, read a problem, understand a given context and then set up and solve the problem. The idea with collaborative learning is to get the students talking together about a problem to see, first of all, if they can decipher the problem, what exactly are its tasks; number two, to draw a little sketch of the problem; and number three, to discuss different strategies about how to attack the problem. The first year that I attempted this, in a class of about 60 students, the students broke up into groups of five or six. In the second year, the department extended the number of contact hours a week in the introductory courses, with the intention of devoting two of those contact hours each week to discussions among smaller groups of students. The discussion leader was another faculty member, so there were two faculty members attached to the course. The students saw us collaborating; we went to each other's section, and we traded the discussion and

lecture. I think that also helped to promote the idea of collaboration. It is fundamental to physics, because people doing physics research typically don't work by themselves. They work within large collaboratory projects. So at the introductory level, we're trying to get the students imbued in that process. We try to get them to work together in groups, and that carries over, because at least half the group was involved in a study group that met to work on homework problems and prepare for quizzes. It's a really important way of dealing with physics and any sort of problem- solving course.

Lorilee Sadler
Lecturer in Computer Science, IUB

LS: We're all here today because we teach large classes. I think I'm the winner, though, I teach A200. I have a section of 350 students, another of 250 students and a small section of 60. We use a lot of collaborative strategies in the classes, not just to help the students learn, but also to help the students feel as though they're part of the group and not just a faceless, nameless ID-number sitting out in the crowd. I do not lecture for the most part. The students are responsible for coming to class knowing the nuts and bolts of what is assigned, and I provide a context, the context of societal computing. We talk about computer ethics, computer crime and computers in history, and we deal with how computers are affecting humen's position in the world. The students come to class knowing that they are going to have to discuss these things, that I'm not going to teach them. In a lecture hall of 350, someone has to say something--it's really uncomfortable if everyone justs sits there. We talk during the lectures, but there's not enough time for all the students to say what they think or what's on their mind. So we've started using technology that's available on this campus through the electronic classroom, called the VAX-notes. The VAX-notes is an electronic bulletin board. All the students have accounts, and they are taught how to use it in a laboratory in the beginning of the course. I pose issues for discussion on the electronic bulletin board. The students correspond, respond, and debate electronically about these issues. This is one way that the students collaborate and come up with some kind of understanding of first of all, what an ethic is, and how to apply ethics to computing.

As an introductory exercise, I have the students post statements about themselves, where they're from, something that's very easy for them to do. This introduces them to the class. One of the things that I do in lecture, together, to give us a sense of community, is to have the students bring 3x5 cards to class, and we do a class survey every week. One week we did it on what kind of allergy medicine everyone took because we were all walking around with boxes of kleenex and sniffling. We came up with the top five allergy medicines taken by the class. We determined how many people had allergies and how many didn't--that gives you a sense of who's in the class. On Labor Day, when we had class, we asked people to write down why they came to class since it was a holiday. It was good to let the class know that 2/3 of the class came because they were hoping to improve their grade, that they were there with like people, not people with whom they did not have anything in common.

In the laboratory section, students are actually doing hands-on computing tasks. Laboratories are a very collaborative environment. Somebody will lean over and say "Hey, I can't get this to work" and the person next to him or her helps. Sometimes you see groups of five or six looking at each others' screens. One person will take a leadership role and they'll help the rest through. This peer-tutoring or peer-guidance has evolved over the

last few semesters into something that's really valuable for the course. I think we all know that once you teach something you know it much better than you did when you were just using it on your own. So those are the things that I use in the large class setting to promote collaboration.

JC: Why don't we go back now and see if you have anything as a follow-up to say to other panelists--reactions, comments.

The discussion as examination

*: I wanted to ask about the discussion as examination.

JS: One of the chief ways that I teach literature is to have students fill out a complicated (for them) discussion sheet. They have to talk about the plot, the themes, point of view, how this piece of literature compares with other literature that they have read, the moral content and whether or not this is important, the author's world view, a whole lot of different kinds of things that they bring with them to class. Then they get into groups of five and talk about this. I don't talk the whole period. They turn in the sheet to me and I grade the sheet both for how they've participated in class and what's on the sheet and what they went on to do.

*: Does each student do a sheet?

JS: Yes, each student does a sheet. And they each have a discussion sheet in front of them when they get ready to discuss the assigned piece of literature.

*: They fill it out as the discussion progresses?

JS: They filled it out before they came, but they add to it as the discussion progresses. As we go through the course, we add other strategies for looking at a piece of literature. So by the end of a course, the students are better than they are at the beginning. The final examination was a piece of literature that they took home in advance with a discussion sheet. I assigned the groups, and I listened to the discussions in class, walking around and picking up the discussion sheets.

*: Is there ever a problem with some people not participating? And how large are your groups?
JS: The groups are five. And yes, there is a problem. There are people who are not as apt to participate as other people and occasionally there are people who have a very hard time in that kind of classroom.

*: Is the lack of participation reflected in that person's grade?

JS: Yes, but it doesn't reflect on the group as long as the people in the group try to include that person.

*: Typically, how much of the critique is filled out ahead of time and how much comes in and is shaped by discussion?

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JS: Typically, the students do a lot before they come to class. They understand that this is a large part of their grade, that I'm listening and that I'm going to pick the sheets up and read them carefully. If you don't grade the sheet, I don't think it's nearly as effective.

*: So the whole basis for grades is that at the end of the semester you total all those sheets.

JS: No, there are other things, too. There are pop-quizzes over content, there are hourlies where they are asked to write different things from the discussion sheets. But the final exam involves thinking out loud.

CN: You can do something about the question raised about what they wrote in class by insisting that in class they use a colored ink that is glaringly different than the one that was used before. You can get virtually 100% coming to class.

JS: But you ask them to write in class, you ask them to add what they thought when they listened to other people talk.

CN: Another thing I'm doing this year is that I give out the pool of questions from which the exam comes ahead of time. And I'm giving extra points if they form a study group and work with either me or an AI for at least 15 minutes in a small group every other week and with each other in between. So I'm giving extra credit for out-of-class participation in these study groups, and it is further increasing the number who are involved in really pre-learning the material.

@: How do you find out whether they participated in a study group outside of class?

CN: You ask them what they did. You don't know with absolute certainty, but it's a course for senior majors, and if you ask them "What did you do last week?" and "What should we deal with this week?" it is a consequence thing. You can go from one to another when asking and they have to at least orchestrate a story--that's almost as much work as actually doing it.

*: How do the achievement-driven students fit into this framework?

CN: Of course, in biology, you have a high proportion of pre-med students whom I would normally consider achievement-driven. There is the occasional problem, but I would say that there are fewer problems than in the class that I used to teach the other way. If a student is not making good grades, then the student becomes unhappy with the whole class. But students who are doing reasonably well actually stress things like the discussion as one of the most important things that has happened to them in their undergraduate career.

*: I think that students who are achievement-oriented students tend to work together better in groups than students who are not that motivated. I think that achievement-oriented students really want to get something out of the course and they recognize that working together in groups enhances that.

JS: Well, it depends upon the level of the other participants in class. If you're talking about a large freshman class of physics or biology majors, you have a tremendous range of achievement, a tremendous range of intelligence and commitment to the subject. When you put the student who is achievement-oriented together with the other student who'd like to

ace the course but is not willing to put in that kind of work and preparation, that's the kind of problem I find in collaborating. It can certainly help the student who doesn't have the skills and the motivation, but overall it can be very frustrating. I work very hard, however, to see that the higher-skilled student is placed with the lower- skilled student.

*: You can do that inside the classroom, but outside of the classroom they cluster how they want.

@: I think that there is too much emphasis on exceptions. Arnold Ayrnes showed that many science courses teach almost nothing, that is, the students who understood it when they begin still understand it when they get through, but the percentage that understands basic concepts in a different way is small. He showed you could go from no measurable change to 85% of this class understanding major concepts. And he started with 10%, so that meant that he taught 75% of the class in major concepts, leaving 15% as an exception. Notice that between, he learned how to teach 3/4 of the class better. And while it's true that one would like to deal with that last 15%, it's important not to worry about it until you've got the first 3/4 or so on line.

Strategies for collaborative learning

*: If I may shift to a very practical question, any strategies for overcoming the extreme physical obstacles to doing collaborative learning? This spring I'll be teaching a lecture course of about 160 students where the chairs are bolted down to the floor. It's going to be very difficult physically to get five people together facing each other.

@: Have them sit on the back of the chairs. They're young. I have a teenage son, and you'd be surprised at what they think is normal posture in a chair.

LS: The other thing you can do is think about having them collaborate outside of the classroom, using technology, a VAX. I'm not sure what technology you have available to you, but you can get an electronic bulletin board set up for your class and have it broken down into groups so that your group can work electronically. This solves a lot of logistics problems: they can participate from their dorm room or the main library, and this way you have collaboration going on all the time.

@: But can you do any group work in that large class? Never :..ind the out of class, never mind the seating part.

LS: I doubt this would work in my two large sections, but in my graduate section, we do have a group project where the students are supposed to go out and set up a prototypical computer learning environment for a person who has stuff on his or her desk and is not using it. The students use the VAX-notes and outside of class time, both, to do their projects, to collaborate and to come up with solutions to the problem. And they actually post their drafts of reports on VAX-notes and critique each others' reports, because you can upload and download files and edit them. There are ways to arrange it so that only specific groups of people can read a posting on the VAX-notes conference, so someone who is doubtful about his work could post it so that just the people in his group could read it.

*: How often do you have to monitor something like that?

LS: I'm typically logged on from about 7:30 that morning until 9:30 that night, from either my office or my house. And I check all the time.

Grading collaborative learning

@: I have a similar question for you about your grading. How much time do you spend doing all that grading in a large lecture class?

JS: It doesn't take very long to grade it if you do it right after class. The longer you wait, the less memory you have of what you just heard and the more time it takes to grade the papers.

*: Is there a high correlation between their written performance and their verbal performance?

JS: There are some students who are very much better verbally than they are at writing. They can jot ideas down; I don't make them write in complete sentences. And I see that some cannot organize for an examination, but can talk really well. This type of testing hits on their various learning styles.

CN: In large science classes, some people are going to things they call micro-ready, where you give the students an essay question and have them write just a topic sentence, or you let them write on only one side of a 3 X 5 card. You hand out purple 3 X 5 cards and a question that can be answered, so you restrict the scope and/or the time. You can tell them ahead of time what the question is and let them think about it, but nevertheless limit them to a topic sentence or one 3 X 5 card. If you tell them ahead of time that you're going to grade in a particular way, you can do things even in a class of 300 students.

Other people have them write an essay question in class, and they grade 10% of the papers. They tell them on the first day that they're only going to grade 10%. Their argument for this is that by having them do the essay at that point, and grading 10%, they can provide feedback regarding the most common mistakes. After 30 papers or so, you have a pretty good feeling of how the class is going to do on an essay exam. You don't worry about the next 270. And as long as the students know this, and they know the chance of their work being selected, they will accept that. You can also tell them that you're going to grade half of the assignment some days to check that the assignment was turned in, and other days you will grade all of the assignment. As long as the students know ahead of time that you don't plan to grade all the writing, then they are comfortable If you explain to them the rationale and give them class time to do it, this is not a major problem.

*: Does this grading of the fraction, thirty, go to the grades of the entire class?

CN: No, I'm sorry, this is no longer collaborative. This was the question of how do you grade all this papers that you have them write, and the answer is in two parts. One, you don't have to have them write five pages to find out what's going on, and two, you don't have to grade everything they write as long as they know ahead of time. And that means, of course, that if they choose to come to class and write "Mary had a little lamb" because they didn't study, and you grade it, they've taken that chance. As long as they know the game, they'll acept it. I've had biologists and physicists tell me that they have done this

and that it works fine. Presumably, if you can get by with pre- meds, then you can get by with anybody.

@: Just a quick follow-up. I have not done it the way you've done it. My assignment might include all the homework that's available to a student in the text, but I will indicate ahead of time that I'm going to grade certain questions. I've done this with both beginning, non-major type students from a wide spectrum of disciplines as well as graduate students, and it's been accepted and has worked pretty well. You can actually tell the students who have carefully gone through every question and done it well, and you also see those who are trying to get by with the minimum.

CN: I bet that would work if you assign ten problems and you tell them that you are only going to grade two.

Optimum group sizes

*: Can I ask a question about numbers? When you use small groups, what is the magic number? Is it five, or can you have groups of three or four?

JS: Introverted people have a hard time in a big group. What is the percentage at a university? Is it 50%?

BC: The percentage of students who consider themselves to be shy hovers between 42% and 47%, and that is extremely consistent. We've been charting this at IUS for ten years and this is very consistent with what other people have gathered at other universities. When you have a situation such as a large introductory psychology course, this makes it difficult to get people to say anything because they're relatively shy and unsure about themselves as well.

@: But when they get into their particular context, do they actually operate that way? What I'm speaking from is a long time experience with students in the laboratory, where you get to know them. They operate with one another very well.

BC: That's the idea of social skills. Once people know the drill, the confidence appears and the shyness seems to drop away. Collaborative learning is all about building these skills.

CN: There are two issues here. One is the definition of what constitutes being introverted. To be introverted means that you'd rather talk to people with whom you're very familiar than with strangers. If you use that definition, you have a much higher level of introversion than if you mean pathologically introverted. There's a very small fraction who is pathologically introverted to the point where he or she can't talk in a laboratory group of two people; there are a lot of us who are pathologically introverted if the question is "Would you like to address the U.S. Congress in ten minutes?"

*: What happens particularly with trying to get them to work in groups is that as the semester progresses, you'll see them blossoming, and their interactions become that much stronger.

@: Very often people who are not good at face-to-face do quite well in the written medium and the bulletin board, when they aren't staring in someone's face.

CN: Notice that as the semester goes on, the situation becomes less threatening, because you're more likely to be sitting next to someone that you've already talked to. And so you get an increased participation.

To come back to your question, the upper limit of the group is set by two things. If the people don't know each other well, the bigger the group, the more threatening it tends to be. Smaller groups will get you a higher percentage of participation. If you form a group of more than seven or eight, there's a tendency for it to fragment. It ceases to stop functioning as a group and starts functioning as an amoeba or something. For many purposes you want the group's attention focused more strongly. The lower limit is set by how long you want people to talk, and how complex the task is. If you go down to two, and neither of them really understands it, then you collapse substantively. If you're at the level of four or five, the chance of someone understanding a piece of it that you need is higher. If you're at two and one person quits participating for any reason, the group has had it. And the chances of someone choosing to stop participating increases with time. So if you want people to talk to each other for three minutes,then two is a good number. Two people can manage to keep talking for three minutes. If you'd like them to talk for half an hour, two is not a good number. If you're asking them things that none of them knows well, two is not a good number. And so the trade-off of many things leads people to groups of three to eight, with five to six as optimum.

LB: There is another aspect to it as well. Last year in discussions we had people work in groups of five to six for approximately 2/3 of the discussion section. We then selected various people from amongst the discussion groups to present to the entire class a solution to a particular problem. That is collaborative learning, if you'd like in a larger context, a larger group, maybe twenty to thirty students. I think that helps the students gain confidence. Not all students do well at this, because they're really fearful of presenting a result to a larger group and being subjected to criticism and so on. But some students relish the task of going up there in front of the entire class and telling them how to do a particular problem. So I think that there is call for different size groups for different contexts, one of which is really stimulating discussion amongst students. The other is to develop some confidence in the students about talking to students in larger groups.

Comparison of techniques: Lectures and discussion sections

@: I wonder if any of you have tried to apply this when you have a large lecture and discussion sections. Does this work on both sides, or do you think about one or the other differently?

CN: That sounds like the structure of my course, but I don't understand the question. I have separate discussion sections and a large lecture.

@: Do you use this differently in one or the other of those contexts?

CN: In the larger group, the discussions are shorter; I'm more likely to have a three-minute discussion. I'm doing more presenting and using it as a way of instantaneous reinforcement of what I've presented and to generate questions and participation. It serves as a way of making lecture vastly more active for the students. Whereas in the discussion section, one has time for them to work, to prepare in a different way, and to work together and do tasks which are more complex than any that they could do alone. A higher level of

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critical thinking, to be precise, is what I'm aiming for there. I learned the method I'm using in the discussion sections from a woman who used it in lecture sections of 100 to 150, and broke the whole class into groups of five for the whole hour. So it's possible to do that in a classroom full of 150 people or more. The reason it's possible is that if we had 50 people in here and broke them up into ten groups of five, any one of us could look at a group across the room and tell who was participating and who wasn't. As long as the teacher uses the written work for content and the class time to monitor participation, you no longer have to hear every word that's said. Then there's the practical limit on how many people you can have discussing at once. You could do what I'm doing in the small things in a lecture section if you prefer it. I would just rather have them put the extra time into it when it's a smaller context, partly because I'm so introverted. Thirty groups of five is intimidating for me.

LS: I deal with it somewhat differently than Craig does. I do the critical thinking in the lecture, and we don't break up into groups. On the first day of class, I liken our class to a talk show where the audience participates. The goal of the lectures is to come to some group understanding of everyone's input. The students give that input, and we develop some kind of consensus about whatever topic we're discussing. In the labs, the students help one another with their lab assignments; it's a hands-on practical application part of the course. So the emphasis is different. We're solving big problems, philosophical problems if you will, in the large section, and using the smaller section for solving concrete, practical problems.

@: A fundamental principle is that you have to be reasonably comfortable with what you're going to do if you expect it to work very well.

BC: What I hear over and over again is that it's very important to put yourself in this collaborative process. That is often times what you do in extremely large classes, but I think that going to them and floating around the room is very critical. Don't just say "You people go back there and discuss." It's critical that you participate and provide immediate feedback. The kinds of exercises that we have developed are designed to do that. Notice that invariably, they bring these things back right away, and we provide the feedback if not that class period, then the next class period.

The role of the instructor: How much supervision?

*: I have a problem with trying to derive consensus and pooling the group ignorance. How directive do you have to be in running a discussion in a large lecture? Do you have to snuff out the dumb ideas early--I mean how far do they go?

@: I think it's a big mistake to declare any idea dumb. The students should have the option of finding out that a certain approach is not going to work. If you try to micro-manage them into a certain thought pattern, then it really defeats the purpose. It's almost like standing up at the front of the class and showing them how to do the problem. The backbone of collaborative learning is to give them the chance to make mistakes. It's important that they ultimately do stumble upon the correct answer, but it's almost equally important for them to explore paths that don't work.

JS: If you give them enough time, I think that by and large, they will come back to more fruitful pastures. This is when you hear them and you think "Oh, my gosh, let me stop

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them now," but they will say "Wait a minute, this won't. . . ." You have to trust and take that leap of faith. Ask yourself if there is a right answer that is more important than the process. Sometimes I think there is, but how often?

LS: That's a very real world thing, where you go down one path and you decide that's not the right thing, and you come back and go down another path. If we're skipping that trial and error, we're skipping some portion of training that is a real world skill.

*: Having a healthy tolerance for ambiguity, realizing that there are many approaches to a single given problem, and being comfortable with the views of other people: you put it very appropriately, that's a real world kind of phenomenon. You need to be able to do that and exchange with people. So in a sense you're not only teaching them intellectual skills, but social skills as well, as a critical component of the collaborative learning process. Jigsaw education, bringing people together of different abilities, so that people are learning from and teaching others who are not like themselves.

CN: There is a cogeny in the heart of this that no one should go into blindly. The woman who taught me about this said "When you break them up into groups, and you hear them blowing the content, bite your thumb. If that doesn't work, put your shoe in your mouth. If that doesn't work, leave the room. But don't interrupt them on content grounds." I've found that if you'll just let a group run after they've scrambled the biology so badly that no one could ever survive, about five minutes later they'll get it straight. It's just awful for a man with an extra 25 years of biology to only be worth five minutes. So it will be very hard on your ego to watch a class straighten out where you knew you had to save them. Most of the time they will, and the few times that they don't, you will know that you have them discussing something that they're not competent to discuss yet, so you've made an error in the discussion assignment. It is possible to pick something that they can't straighten out, but if the assignment is anywhere close to the ballpark and you have four or five semi-interested students, they'll straighten out the biology or whatever between them. Now I had one class where there was a sort of psychopathic male who led a bunch of them down the wrong path. There were a bunch of women in the group who had the right path written down the whole time on their papers, and I gave them a B for the session, because I told them "You let this guy lead you through a pack of nonsense, and you knew better". It only took one round of discovery to learn that delving into nonsense hurts your grade. They had known enough to straighten the group out, but the social dynamics prevented them. That happens occasionally, but it is always straightened out by talking with the people who knew better. You can't let the discussion fall into nonsense because some person is misbehaving.

@: I have a quick question. I'm interested in the physics program: how many central topics or themes do you explore in one of those recitations?

LB: The recitations work with guidance in the sense that either the homework or similar assignments are discussed. Typically, we talk about four or five problems, split amongst the group. We encourage the discussion to divert from the specifics of a problem, because students oftentimes get a very narrow view of the topic of physics by working on freshman problems. And we try to talk about how this problem relates to something completely different than what the question's asking. We purposely try to bring in more content beyond the narrow scope of a few problems.

@: Do you pose leading questions or something to prompt it?

LB: Sometimes we plant leading questions. Sometimes we just take a problem that looks innocent enough and use that as a context to bring in results or recent research, to try to heighten the students' interest in the subject beyond just the challenge of the problem, to talk about physics that's actually going on.

Folk theorems and collaborative learning

*: I was going to bring the discussion back to the previous point, in the teaching physics section. Everyone comes to physics with a theorem of how he or she thinks the world works--folk theorems. The problem with traditional physics education is that, yes, they can recite Newton's Laws when they're done, but they haven't made a dent in their folk models unless they first understand what their folk model is. The technique is to make them grade objects, for instance, how hard is it going to hit a wall or something, and then relate that back to how we think the world works. I think your point is well taken, that you do have to wrestle with some misunderstanding on a large scale in the beginning, but it's not clear to me that you can usefully subvert the coil of doing that from above. It seems to me that it's more likely to succeed if their peers wrestle with the mistaken model.

@: Well, I think that you have to give the students some latitude to work out problems, but at the same time you have to give them the right tools, the right framework to deal with the problems, and you try to get them to stay roughly within that framework in dealing with a new problem. That framework is the Newtonian view rather than the Aristotelian view of the world. That is definitely a struggle, because from birth everyone generates some idea of how the world works and what gravity does, fundamental ideas of motion and so on. I'm not sure that anyone has a real solution to how one overcomes many years of incorrect notions about how the world works.

LB: The premise is that you must confront that wrong model at some point, not simply paste a set of equations over it.

JS: I think that a collaborative model is a wonderful model to use throughout the semester, but I don't think that every moment of class is a moment of sharing. There is a time for some kind of authority in a class, even though we don't want an authority model. I think it's a really hard balance. But I find that if the students only discuss, they wonder why they're here, they could have done that at lunch. Does everyone find that to be true?

LS: We have the opportunity to talk about things and understand different perspectives. People will even post on VAX notes "I never got the chance to think about this before," and to know that we're providing that kind of opportunity is really important to me. I mean, it's very fulfilling to know that students have grown as a person, not just as a computer literate entity in my class. I don't do very much teaching at all, I'm more of a facilitator. If we're talking about content, I'm still facilitating the dissemination of that content from the students. I don't stand up and say "This is what RAM is, this is what ROM is." We talk about how the machine works and the students come into that. The expository style is not one that I use very often. I feel very alienated from the students with that style.

*: Some of the content of the materials about the permanence of misinformation prompts me to make an observation. For chemists, the model for atoms is a pretty important thing, especially the electronics system, and you get people with very little prompting to be able to

deal with at least qualitative features of the atom in ways that we would think helpful for them, such as the mechanical view of the atom. But you find the same student with a planetary system of the atom which is totally unhelpful in anything they're trying to do in terms of bonding. And this notion that they got some time in their past, stays with them, in spite of the overlay.

JS: I think that's true in any discipline. Perhaps the sciences are more aware. Bernie, don't students come with a whole mythology of ideas about psychology that they have when they come and no matter what you tell them, they have when they leave?

BC: They get these things at home. The thing that I've come to realize is that you don't completely turn people around. What you do is you make a dent in these people and then they pass that on to the next generation, so that their children know a little more about psychology than they did before, and that's a sense of what happens in the accumulation of knowledge. One of the biggest misconceptions that people have about psychotherapy is that people can change right away. What they don't realize is that it took this person 22 years to become an alcoholic, and it's foolish of us to think that we can turn this person around with a thirty-day detox program. I try, especially with students we have at our university--many of them are first generation college students--to be very tolerant of that, and realize that I am an agent of change and this is where the process starts. So by bringing these things forward, hopefully they'll go home and do these things the way we have suggested and they'll talk to their other relatives. It spreads, but it's a slow process.

LB: One aspect to that veneer is that if you stress the students, if you give them examinations or whatever, they frequently revert to what they knew before. One thing we have done is to institute weekly quizzes, for example, where we continually try to push the students to see if these notions they had before or the Newtonian view pulls to the surface. I think it is important that examination on an individual scale be part of collaborative learning in some sense, at least in physics. You need that balance between the lecture format, the discussion format, and the individual work format; all three are very important.

Student response

*: How long does it take an individual to adapt to this group setting? They're so accustomed to this lecture format.

LB: They begin with the homework and the quizzes, and what happens is the students quickly discover that their fears are coming true. This stuff is hard and it's going to take hard work to do it. In fact, they rapidly welcome working together in groups because it helps to overcome the fear.

@: One of my best experiences, probably the only formal collaborative thing that I've done routinely in teaching, has been to start a laboratory program. The first time students get into organic laboratory, I hand them unknowns, and the switch to collaborative learning is almost immediate for half the class or more. Some of them go off in their own little hole. Others very quickly start to look at one another to see if somebody has something to give, and others will stand on my feet, trying to get inspiration or something. So it's quick.

Structuring collaborative groups

*: I'd like to ask a question about the mechanics of the group. How often do you change the groups? How do make the assignments?

#: We have not made formal assignments. I think that students tend to develop bonds and they maintain them through the semester. It might be better, actually, to force the students to go from one group to another. It's been an experiment, so there have been holes in the experiment, and one of them may be trying to broaden their interaction within the discussion. That's something that might be important to do.

&: I know in my big classes I see them come in with roommates and friends, so they just maintain the same social contact they've had in the past.

BC: At our university, because we have commuter students, they tend to associate closely with people that they've gone to high school with, for example. So when we have collaborative kinds of assignments, the assignment typically involves people from this part of the room, going with these people. We do it that way because otherwise, they fall into these patterns and in a sense, nothing new is learned. And I think a critical dimension in this type of learning is the social skills.

*: I think it would be very critical to me to know which group I would be in in physics. If you have people selecting their own groups, don't you have people being excluded?

@: I don't think there's been any correlation between students doing well in a course and the group they work with. There are groups that are much more lively than others. But we try to encourage the students to work hard, and we try to foster the notion that they really do need to work at this to learn it. And they all, fairly uniformly throughout the class, do so. So we do try to break some of the ties, but there are a lot of other things going on in introductory physics. They're learning a lot of different things in that course; they're learning how to confront problems, for the first time really. They're learning physics that they thought they knew because of their eighteen years of accumulated experience, and all of those things going on at the same time can make it difficult. You might try to do too many things there.

*: This fits in to the collaborative part, that I've found, this is particularly true in a class that I think was the most energetic and stimulating laboratory class that I've ever had. To remember it after thirty years of teaching shows the impact that it made on me. We had teams of students. Each team had a project to complete as a segment of the course. There were two groups. Each had one very stellar individual and they tackled the same end objective, but they independently came up with two different approaches, and they literally raced one another to the objective. There was a very high level of enthusiasm and activity beyond those two groups who were involved, so the competition was a so-called collaborative atmosphere. I can remember the effort and what various people got out of that.

CN: There's actually a formal name for that--competitive cooperative, where you have cooperative teams competing. The answer to your question depends in part on what you're trying to achieve. Where I'm just having them discuss one paper and not having them build a model that continues from class to class within the group, I find it very useful to reshuffle each time for the reasons you suggested, so they don't have the sense that they're in the "good group" or the "bad group," and so that they have a broader acquaintance of people who they can call up and work with collaboratively. And they say things, these are

seniors, like "Wow, we've been in classes with these people for four years, and we never knew any of them." On the other hand, if you have a path that continues across periods, then certainly you want to leave permanent groups. The most extreme example of that was in a class I co-taught with an English professor here. He was teaching Introduction to Literary Criticism, and the student's task was, by the end of the semester, to be able to articulate her critical perspective of literature, and to justify it on the evidence of the critiques she'd written of literature: and to be able to do that some task for the other two people in her group. So they were in groups of three, in which understanding how the others' heads worked was a critical part of the task. In that case, of course, rotation would be toxic--it would destroy the whole task. You have a gradient from that where you have to keep permanent groups. He assigned them intuitively after knowing them from one period, but he did it with some sense of not sticking the two best together. At the other end, if you're just doing two-minute conversations, then it doesn't matter who is sitting next to each other.

COLLABORATIVE LEARNING AND SMALL GROUP PROCESSES IN SEMINARS

Moderator: Patricia Andrews (Communication/IUB)

Panelists: William Browne (Beh. & Soc. Sci./IUE)
Margaret Ann Dirkes (Educ./IPFW)
Sharon Hamilton-Wieler (Eng./IUPUI)
Ray Russo (Biology/IUPUI)
Susan Shepherd (Linguistics/IUPUI)

Patricia Andrews
Professor of Speech Communications, IUB

PA: We had a grand plan for this afternoon that probably isn't going to work because we're small in number, but we'll make it up as we go along. I'm Pat Andrews from Speech Communication here in Bloomington. My role is to introduce you to each other, and those in the audience may want to say a few words about who you are somewhere along the way. The focus of this particular seminar is supposed to be on collaborative learning and the small group process. The panelists who have been selected to speak are all individuals who use collaborative learning in conjunction with small groups in some way: I think we'll find in many different ways. Let me just say a few words about who the panelists are, and give a little background information. I will introduce them in the order in which they will be speaking. First of all we have Bill Browne, Chair of the Behavioral Sciences Division. He's a Professor of Education and Psychology at IU East. He uses collaborative learning, as I understand it, in all of his teaching, and he teaches a great deal--all the education and psychology classes on campus as well as statistics and computer education courses--so his experiences span many different teaching contexts. The second person who will be sharing her experiences is Ann Dirkes. She is Professor of Education at IUPU in Ft. Wayne. She teaches both graduate and undergraduate classes in several different areas: mathematics education, testing, creative problem solving, and metacognition. She's particularly interested in thinking strategies and self-direction in learning. The third speaker is Ray Russo, who is an Associate Professor of Biology at IUPUI. He teaches a Principles of Ecology course that is required of all biology majors and is part of their core. He uses computers extensively in his teaching, and I'm looking forward to hearing what he has to say about a computer simulation that he's created. Collaborative learning comes into play in that students work in pairs to work with this simulation. And then we have Sharon Hamilton-Wieler. She is an Assistant Professor of English at IUPUI. She's had extensive experience with collaboration in teaching several different writing classes at IUPUI. She has done research in the area of collaborative learning, and you may be interested in questioning her about that later on. And she has created a video on the collaborative learning process with students in some of her classes. Finally, we have Susan Shepherd. She also is an Assistant Professor of English and adjunct Professor of Anthropology at IUPUI. However, she teaches linguistics courses and does collaborative learning in that context, specifically using electronic mail.

William Browne
Professor of Education and Psychology, IUSE

WB: I want to add a couple of points about my background. I am a developmental psychologist. The thing that I like about collaborative learning is that the student now becomes an active participant in what is going on in the classroom, rather than just a passive learner. And that's one of the reasons why I've tended in most of my classes to use some form of a collaborative approach. The things that I expect to have happen within my classroom are based upon what I consider my operational definition, which I would like to give and which is what we're here to talk about.

Goals in collaborative learning

I assume that three things will happen in my class when I decide to use a collaborative approach. First, students will work together in small groups. What do I mean by "small group?" Two to four people: I never like to use a group larger than five to seven. By the time it gets to seven people, a group begins to give me a bit of a problem, unless it's a very large task that we have to deal with. The second point that I see in my structure refers to what collaborative learning will do for my class. What it will do for my students is draw on their strengths. Those students who are a little bit shy are going to be drawn out, because I believe that they, too, have some strengths. The third thing that I assume will happen is that they will assist one another. That is indeed the purpose behind collaborative learning--that they will see the strengths and weaknesses of each other and work cooperatively.

Coming out of all of this, I assume that an order of relationship will have been established among the students which will be better than if they had not had collaborative groups. So rather than knowing one or two, they're going to know far more people. A second goal involves the development of good communication skills. I'm not trying to say that I'm teaching speech or that I'm teaching English, but I'm trying to help them improve their communication. The third, and the most important thing that comes out of collaborative learning, has to do with the fact that (referring to Bloom and levels of understanding) to my way of thinking, the traditional methods of teaching in a classroom tend to focus on the first three levels: knowledge, comprehension, and application. By using collaborative learning, I feel that we're able to foster the upper three levels: analysis, synthesis, and evaluation. And I can, in a sense, control whether I'm receiving analysis, synthesis and evaluation, not by giving them a test, but by working with them towards developing those skills.

Structure in the collaborative classroom

One of the things that I've learned, and I'm sure other people will tell you the same thing, is that if you're going to use collaborative learning, it has to have structure, probably more structure than would would be required in a traditional approach, a lecture. The first thing is careful planning. And with collaborative learning, careful planning involves clear explanations of exactly what you're going to do. It has to be very, very clear to the student. A second point concerns explicit directions. You may think that the little handout is explicit, but it won't be when you're expecting these people to work together and to begin to develop some of the systems there. The third thing that I found in terms of the planning is that I like to consider the background of the students that I have in a given class. I can do that when I have smaller classes, but if I can't do that, especially when the

task or group activity requires some prior learning, I have to make sure that the students have that background, or that I have provided that material. So to plan it takes a little more time than it might take to put a lecture together, because you have to consider all of these issues.

The thing that I found helps a lot is the idea of novelty, and I'm using the word very broadly here. But I'll give you an example. Part of what I teach deals with test and measurement in psychology and in education, and we have something called the test critique, where you take a standardized test and critique it to see if it's applicable in a specific situation. What I have done is to select a group of standardized tests, have them typed up on a piece of paper and cut them into little slips. I put four of the same name tests in a pile, from which students draw randomly. And then I say to the students, and this has been the novelty part, "You may do this critique which we've talked about individually, or you may work in a group of two, three or four. If you form a group you can give me one report, or two or more reports, however you want to work this situation." In the beginning, they really don't know how to handle this, because they have not had this much freedom. I did this this semester, and what makes me feel good about it is that the vast majority of students have formed groups and divided the tasks that they're going to do, which is nice because they're in teacher education. I think what I'm going to find is that they have decided on their own that a single task report will be sufficient for all of them. The other nice thing is--I don't know if this is just a fluke--but no one has asked me how they're going to be graded. And that's usually one of the first things that happens.

All right, some of the other things that happen. Monitoring progress: I think that you really have to stay on top of this. I do believe that the experience that they've had needs to be evaluated in some way. There are a couple of ways to do that, mainly through discussion or some written format.

Keeping groups small and the arrangement of physical space are other things that some people don't think about. If you've noticed in the groups we've had in this conference today, no room has stayed exactly as it was. Things have been moved, and I think that it's because this type of thing lends itself to a more relaxed atmosphere. I happen to be lucky enough to teach most of the time in a classroom where we have table settings, and I can have automatically six groups of students the day they walk in the door. If I don't get lucky enough to get into that room, then I can "circle the wagons" with chairs and work with them. I think that environment is very important.

One other thing that I would mention I've heard two or three times today, but I think it is worth repeating, and that is that students have to be prepared to do this type of learning. They really cannot be dumped into it. You have to have some way of shaping their behavior. And I would attempt to do so, even if you use just a small task and have them talk about it. It might not have to be evaluated, it might not have to be corrected. Let me give you a couple of examples of additional types of things that I've done. There's a fellow by the name of Burns who talked in '81 about "groups of four." I don't know if you're familiar with that, but it's kind of a neat warm-up and I use it here. With the "groups of four" model, you put a group of four people together to work together, and you don't focus on achieving anything. This sounds as if you're not doing your job, but what you're doing is getting the students ready to work collaboratively. The individuals are not accountable for what happens within that group. They merely work on a task. I do this in my Child Development classes by giving them a case study the first day and talking about it from our experiential background. It helps get them used to the idea of working together

and using the information they have from other individuals. One of the other things that I work with, Kagan, is called Co-op Co-op, is a little more major, because you have to choose a main topic, and the topic has to be divided into mini-parts. Mini-parts are then assigned to your group, maybe four, or five, or seven, whatever you're dealing with, and those people become responsible for researching that mini-topic in depth. Those group members come back together after research for a group discussion, and that group is responsible for a presentation to the class. I've used this in a class where a topic like child development was very important to the the content, but I was not focusing on it. I took groups and broke them up across the age span, and said "The topic for you is to find what's current and hot (currently taught) within your age span right now". Then they begin to work through all of the issues that are important to the area we're dealing with, and they make a major presentation to the class. I try to work as a facilitator.

I also use controversial issues. I occasionally use competitive cooperative groups. Slavin talked about team approaches. What I've done in an ed. psych. class is to assign about nine models of discipline, and give each group exactly the same case scenario to work with. They research that case, based upon the model and the theory that they have. After those presentations I spend an entire half of a class, an hour and a half, where we look at all nine models collectively and try to make decisions about which are the best. This forces them to go to a higher level of analysis after they've looked at the cases on a more simplex model.

Innovative uses of collaborative techniques

Just two other things I'd like to share if I have two minutes. Sometimes people say that classes don't lend themselves to collaborative learning. I teach a statistics class, and we do collaborative learning in statistics. I've been able to bring people from the community, from the class, and other faculty together into collective groups. We've worked with places like WIC, which is Women, Infants & Children. They had a mass of data that they had no idea how to handle, and the idea came to me that this would be an excellent way of getting some collaboration. So the students are here, the community is here, we take a look at those projects, we actually analyze the material and do something worthwhile for the community, and then all of that is shared with the class at the end. We have a unique new degree on our campus, which is a Bachelor of Science in Behavioral Science with majors in psychology, sociology, and human services, with a multi-disciplinary required core. We are preparing a seminar that will be inter-disciplinary and collaborative. There will be a faculty member from each of the three disciplines in charge of that class. Students will be grouped based on those majors and people from the field, and they will form a team which will look at major issues. And they will try to solve, work with, and apply their various areas to those particular issues. What we hope to have come out of it are student presentations which could be shared with the other faculty and other disciplines.

Margaret Ann Dirkes
Professor of Education, IPFW

MAD: I'd like to begin by making a connection between the collaborative learning concept and what I do with self-direction in my courses. I think that the purpose of collaborative learning is to get more students participating, and that means to get more students thinking. When you talk, you have to think. When they just sit and listen, you're not sure if they're thinking, much less what they're thinking. I use self-direction as a base to raise the level of thinking. What I mean by self-direction is that students learn to know when they're

learning and when they're not learning. They learn to state the objective; "What are you trying to do today?" So in spite of the fact that the instructor states the content and subject matter objectives, students have to say "What I am doing today is . . . ," and I find that that in itself is a far cry from what they're accustomed to.

Collaborative learning and self-direction

In order to make self-direction work, I have discovered, I have to first teach them to produce ideas. When I say idea production I mean brain-storming, but I don't use that word because they have previous experience with it. So I call it listing ideas, and this gets them into a productive mode of thinking. They do recall what they've memorized, but it also gets them to make connections. I think that this is the way that people function outside of classrooms. They collaborate with people; they know when to collaborate with people and they know when to start generating their own ideas. The strategies that help them regulate thinking are some elementary strategies like knowing the difference between asking a conceptual question and asking a procedural question. Asking when the assignment is due is far different from asking why they would need to know the density of a solution, or what it is for. Why did Saddam Hussein invade Kuwait? Some questions that very much deal with purpose are in mathematics. I find adults who have never understood the meaning of division. They can do division, but they don't know when to use it and how it's different from multiplication. They can tell you, but they don't understand it.

I try to introduce problem-solving strategies in any class that I teach: this business of stating your objective. What are you trying to accomplish? What do you already know? I spend quite a bit of time convincing them that they know more than they think they know. This helps them to produce their own objectives; it helps them decide whether or not to collaborate with other people. In the middle of the course each semester, I give out a little half page satisfaction check. You write the numbers from 7 to 1. How satisfied are you with your interaction with students in this class? You're very satisfied, 7, going down to 1, you're not satisfied with your interaction. I do quite a few things like that, to make them aware of the ways that they are directing their own learning.

In almost every case I show them ways to list the possibilities for outcomes and the possibilities for other factors that might be involved. For that reason, my directions are not explicit. And I spend some time trying to make people comfortable with the world that is not explicitly defined. If the students keep asking themselves what it is that they need to learn, we're dealing with adults who already know a great deal. What do you know? And what don't you know? How much time do you need to spend on this? This is the metacognition business, which I think is very important. Is this something complex for you, is this something new to you? Novelty and complexity are two important characteristics of learning that we find difficult. If you can recognize one of those characteristics, it would seem that you would tell yourself to spend more time with it. I find that even adults become very impatient with themselves when they can't learn something immediately. So if they have had some experiences working in groups, they find that there are other people like themselves, and that is indeed helpful.

For at least fifteen years now, I have been working with a class format in which I probably give more assignments than most instructors. But part of every class period is used for independent learning. During some of the time designated for large group instruction, I use small groups for collaborative learning strategies. During the independent

learning time, they have the course objectives and they also have this list of assignments. They can work with one another on them, which most of them do, or they can work alone, and they can work in this classroom or any other classroom on this hallway. So they go into some of the drafting classrooms that aren't being used this period or whatever they can find. Then I'm free to interact with them individually, and they're free to interact with one another. I don't structure that type of interaction. During the independent learning time they also have access to all the resources that I have on my cart. I wish that I had a laboratory, but instead I get the students or myself to bring the cart to the classroom. Even if I'm teaching the course on Research for Elementary School Teachers at the graduate level, instead of having them go to the library, I bring part of my own personal library on the cart. They do more reading, interact more with each other than if they were just sitting and having me give them my words of wisdom.

Testing in collaborative classrooms

This kind of arrangement requires that they accept the fact that knowledge is uncertain, and they accept the fact that they're going to be uncertain about course grades, because they tell me that they haven't been in a class like this before, and so their grade is not as predictable as it is in some other courses. They also accept the fact that they know more than they think they know. And if you want to make this real to them, I have found that it also has to be part of the testing program. You can't speak in terms of picking each other's brains and listening to each other and being self-directed and all of that, and then give multiple choice tests. I don't give multiple choice tests. There might be a few very important concepts, and I might ask them to reproduce those on the tests, but there's always a section which says "List as many ideas as you can about statistics". In P507, my graduate statistics class, that's the second part of the test. They know the question ahead of time. I'll give them three categories which are crucial. If they list ideas which are completely irrelevant, those ideas don't count. The students find that they study differently, that they have to decide what's important to learn. This question of testing requires quite a bit of development. It has to be at least a partial component, or else students don't think that you mean that they should use their own thinking. That's the most important part. I say to people, "Think your own thoughts. Listen to what I say, listen to what the textbooks say, listen to what your peers in small groups say. Take it all in. What do you think it means? What do you think is important?", to shift this responsibility to the individual.

But it isn't total responsibility. On the course outline I give the objectives for the course and how their performance will be evaluated, so there is some direction. All of the assignments get them into areas of important content for the course. But they have to decide whether they're going to continue to ask me questions. And there's always a couple in every group who ask what they're to do. Gradually, I try to get them to think for themselves; I'll say, "Well, you can decide that." It's a very interesting experience. I try not to answer many questions myself. It's not that I don't want to help them--if they ask me a conceptual question, then we might have a significant discussion--but if they are uneasy about working in groups, I want them to overcome that uneasiness. They mostly work in pairs, to avoid the organizational requirements of having a group of five to seven. There is more interaction with two people talking than there is with seven in a group. To encourage interaction in the large group sections, I will say "Turn to a partner, and tell your partner what you think it means." And sometimes I'll say, "Okay, person A and person B, person A--talk to your partner and tell them what you think this concept means, and you may not stop talking until I say stop." That's an interesting ploy.

In small groups in the large group sections, I lecture part of the time, and then I put them into groups no larger than four. The chairs are difficult to arrange, and you get more interaction with smaller groups. So I usually ask for a group of three or four. They work on some sort of a problem or list 20 ideas about a topic. When I say stop, I tell them to look at their lists and star the three most important concepts, and to double-star the concept which is most unusual and least likely to be listed in the group. Then they put two ideas on the board. Everyone gets to see the ideas on the board. The instructor comments and asks questions about them. So you have independent thinking together with interaction with the instructor.

Ray Russo
Associate Professor of Biology, IUPUI

RR: Good afternoon, my name is Ray Russo. I'm an ecologist at IUPUI. I teach a biology course for majors that deals with ecology. Actually, I began using collaborative learning due to some of my own experiences as I grew up and went through graduate education. I graduated with a B.S. in Biology, and I really wasn't sure about what I was going to do. Somehow teaching trapped me, and I became excited about it. I began to realize that in spite of the fact that I thought I really understood biology, when I went to teach, I didn't understand it as well as I thought I did. I came to the realization that it was through teaching and explaining the concepts and the ideas to someone else who was going to be critical that I came to understand it. I'm following the principle that in order to understand something deeply, you have to teach it. I have put my students in the position of being teachers to a critical audience.

Collaborative learning in the computer lab

Now the particular circumstance in which I use this setting is kind of unusual. As ecologists, we take a lot of field trips through forests and streams. Of course, God isn't always cooperative and it rains frequently. I haven't lost any students in a flood recently, but certainly the inclement weather prohibits field trips at certain times. About two years ago, more than half of my field trips were rained out, and I said that this wasn't going to happen to me again. How could we have a field trip without going outside? Since I've used computers extensively in my teaching, I began to develop computer simulations of field trips to the forests, where students would be collecting data off of the computer. In other words, they see trees to identify, measure them, and compare different types of sampling techniques.

When I first used these computer simulations, I would install them in the local computer cluster, and I would give the assignment in the laboratory that they were to do the simulation, collect the data from the trip to the forest and come back to analyze the data as a class. When I visited the computer cluster and saw the students going through the simulations, they were getting hung up by two things. A lot of them were simply not used to working with computers, and they didn't understand how to design an experiment using the computer simulation, and some were getting into the simulation and progressing nicely but because the simulation was complicated they would get stuck and not know how to continue. At that point, I recognized that I could pair the students, or group them in threes, and have them help each other work through the trouble spots. After I made that assignment, I discovered another benefit of this, in fact, this other principle that I had learned. I found, in watching the students, that they were explaining to each other not only the computer simulation but points of pertinent lectures. Students were really turning into

teachers of other students. I thought, "This is always going to be a one way street, the smart kids are always going to teach the slower kids." But in fact, that's not what was happening. The smart students found that the students who seemed to be less brilliant had significant contributions to make. They had made connections between the computer simulation and the things that I had said in the classroom and they remembered things from their textbooks or other exercises that the bright student had not thought of. I was seeing a flow of information either between the pair or the group of three. I found that if we have more than three together, there is not enough discourse, and each student does not have the chance to say enough.

The way that I use collaborative learning is fairly structured, in the sense that the students' objective is to get through the computer simulation, to take this field trip in the laboratory; and the collaboration occurs as a side benefit. It happens, not because I instruct them to do it, but because they want to get along with their partner and they have something which they can add to their partner's knowledge. I think we've ended up with students who actually understand not only the computer simulation, but how to integrate all the information that's in the course through these discussions.

My plans for the future are to have more computer simulations to encourage collaborative learning, because we were only doing this maybe three times a semester. It's a good idea, and we must try to make use of it. I would also like to point out that there are some problems in collaborative learning. One of the problems seems to come about because of the typical rules that we have in computer clusters, for example: "You shouldn't be talking in a computer cluster. The interaction should be between the student and the computer, not between people." I disagree. The computer is only a tool, and students should be talking to other students. I believe we should encourage that, so I've had to make some rather serious noises with Computing Services, who administers these, to keep their attendants from reprimanding my students for talking. I want them to be able to talk. Likewise, I think that libraries should have rooms where students are encouraged to talk and to discuss what they've read. It shouldn't always be neat and tidy and organized and quiet. I think noise can be learning noise, and that comes about through interaction.

The other kind of problem I see is something that you see, Ann. Many times, when you give the students the freedom to interact, they're not quite sure how to go about it. It's something different from simple socializing. We're social creatures, and communication is our way of explaining our ideas to others. In fact, all we're asking them to do is to act normal, to be open enough to share your ideas with others. And in fact you'll find that you not only have a significant amount to add to the knowledge of the whole group but you have unique ideas.

Sharon Hamilton-Wieler
Assistant Professor of English, IUPUI

SHW: Ray started by telling you how some of his teaching and learning experiences precipitated collaborative learning in his class, and I have a couple of incidents to share with you too, to show you how my approach to collaborative learning has changed. First of all, I began teaching 30 years ago, in a one-room, eight-grade country school. I had three students in first grade, one in sixth grade, one in seventh grade, and one in eighth grade, and all the rest in between. As you can imagine, we needed to collaborate in order to survive. If any of you saw the movie, "Don't Shoot the Teacher," that's the kind of school that I was in: cold prairie winds, water from a well, and an outhouse; it was

primitive. We were, in a sense, almost as sophisticated and savvy as our current students are in the ways and means of collaboration, and we had seen the value of it.

The second incident that I want to share with you is when I was working on my B.Ed. or my M.Ed., and I was taking two night school courses. One was in education finance and the other was a humanities course. In the education finance course and the humanities, we had to make ten-minute presentations, and we had to announce what the presentation was about a week before they began. In the education finance course, the first presentation lasted ten minutes. There was no handout--the person wrote on the board. The second lasted twelve minutes, and there was a one-page handout. The third presentation was fifteen minutes long and there was a five-page handout. And so on until the final presentation was twenty minutes long with a thirty-page handout. It was one-upmanship. Nobody offered to help anyone, and it was just competition to the extreme. In the humanities class, where we were presenting projects, as soon as we had told everyone what our subject was, people helped each other locate information and everyone added to everyone's project. Keeping it down to 10 minutes was more of a factor of pruning the material that your classmates were eager to share with you than actually digging it up. That made me think about how wonderful it was to learn in an environment where people take on the responsibility for helping each other learn in the classroom.

Jumping a few years to my time at IUPUI, I guess I'll tell you one more. I did my doctoral work in England, and I was looking at the work done in six different subject areas in London, including biology, sociology, history of art, history, English and so on. What I found was a direct relationship between the amount of interactive learning that was going on in these classes and how the students actually performed on their exams. The more the information transmission model was followed, (that was in the biology class), the more likely the students were to fail. In the geography class, physical geography, although the amount of writing done in both classes was about the same, there was much more interaction and they scored really well on their exams. There's not necessarily a causal relationship, it could be a coincidental relationship, but that ratio showed throughout the six subject areas.

Collaborative learning in small seminars

Coming here to Indiana, I've been fortunate enough to be in a department that is very interested in collaborative learning. I've just finished a three-year research project and have made a video on that, and I would be pleased to answer any questions on collaboration in a regular size classroom. However, when I was preparing for this discussion, I did take the word seminar seriously, referring to a class of between five and twelve students. And so that's where my talk is going to be. It's really going to be nitty-gritty, nuts and bolts things, because when I show my video on collaboration and talk about all these wonderful things that go on, people ask how I got there, what I did, and how I actually got it to go. And so this may seem really practical, but it is in response to what people have said to me.

I'm going to talk about the body politic, only I'm going to talk about the body as a political statement to start off with. For example, when you walk into a small group, there they are, five, six, seven people. When you place yourself behind a lectern, you're giving a really strong message. Even my sitting up here rather than down there sends a message. I'm doing it for technology's sake, but all of us had a strong feeling that we would rather sit and chat, because we see each other as equals. We don't see the person in front as the only person with the knowledge in the group. You really give the students the message

that you're the one with the knowledge, and therefore, that you're the one who has the right to speak. That's the first thing--how you walk into the classroom and where you take your place, particularly in a small group. Then there are the accessories, such as six or seven books under the arm, all the notebooks and recording things that you put down. And if you plunk them down on the front of the table, right in front of where you're sitting, that says something too. Once again, you're the fountain of wisdom, with all these books, you are the authority. That's really daunting, and because it's daunting, students wait for you to talk rather than being willing to share. They're just scared. You know too much. So what do you do? You brought the books, you want to talk about the books, but you could put them behind you or beside you and bring them up when you need them. It seems like a silly little thing, but those are the kinds of things that silently send a message. . .

Let them know that they have something worth saying, even if it's talking to each other about why they're in class, or introducing themselves and talking about what they think the class might be like: anything to get them talking within the first few minutes of class, that's your opening move. Then what do you do in discussion? For one thing, if you assign a student to a presentation or project, which is often what we do in seminars, instead of telling them that it's a presentation, I tell them that they're going to lead the discussion. That has a different connotation. It tells them that they're responsible for the material, they're responsible for the main concepts and the reading that they're supposed to do, but their purpose is not to be a substitute fountain of knowledge for you. Because you want the other students to have read the material too, I would assume. So the student will be responsible for initiating and maintaining discussion on whatever topic.

Another hint is to avoid being the first to speak when someone asks a question. Often a student will ask a question that almost anyone in the class might be able to answer, but the teacher answers because that's the traditional way of doing it. If you look around, students will see that as an invitation, and if they don't, nudge the students, but wait first. Students are watching you every minute and they take their paralinguistic cues from you. Another thing, something that so many of us do; avoid commenting on each person's contribution. Very often, we feel that if someone says something we have to comment on it and reword it, as if their words weren't good enough. So you've denigrated the person's offering and you've also belittled the terminology that the person has used. Resist the temptation to filter all contributions through you. Students will soon start talking to each other rather than always talking to you. If that is harder to accomplish than you would like, one tactic that I use goes directly against what we do as teachers, because we look directly at the student who is speaking to us, we look at the student as they make a comment. As soon as they have finished, look down or at the class. If you look down, then look up at your other students, that tells them to jump in. You may have to train them, but they really twig on to that. Avoid always being the one to sum up or synthesize; instead, invite somebody else to do so. The next time, don't invite anyone and see if somebody picks it up; if not, invite someone again until they see that it's one of their responsibilities. If a long time goes by without a particular class member participating, then you might have to intervene and direct a question at that student just to bring the student in, because you don't want anyone to sit there all night without saying anything. And question the student on something you know he knows something about, because the idea is not to make the student feel bad. The idea is to make the student feel good about participating.

This is another little technique. When a student offers you something and you want it to go deeper, very often we jump in, but you could look at another student and ask if they could add to that, and then to another. If, at the end, there's something that you think is

critical, then you can add as well, because you're a class member too. But try to use the terminology that the students have been using unless the term is important. In other words, don't take their words away from them. That's a point that I made earlier.

As I said, that's the nuts and bolts. I don't know whether that's trivial for you, but I thought that these were some tactics that would be generally applicable. I have some problem situations here, but I don't think we have time.

Susan Shepherd
Assistant Professor of English, IUPUI

SS: I'm going to talk about a fairly specific situation, a seminar that I'm teaching this semester. It's part of a larger project known as 21st Century Scholars, and I have just a brief description of the project in case you're interested. The project was developed with the support of the Vice Chancellor's Office at IUPUI, and Computing Services, and IBM. What we're doing is providing loaner computers to students in a class to take home. We've done this so far only in small classes. We're using electronic mail to correspond outside of class. The idea is that, particularly on a commuter campus such as IUPUI, students often find it hard to get together to work on group projects. Very often their time on campus is limited and their outside commitments make it difficult to interact with other students. We thought that with electronic mail they could communicate at their convenience. And it might be a way to establish a sense of community that is lacking in a lot of classes, or on the campus in general. There's less feeling of community than there is on a residential campus. So those were some of the general goals behind the project. We were also hoping to help increase computer literacy on campus, provide equitable access to students from all sorts of different situations, and we've been paying particular attention to students with special needs, physical disabilities or economic hardship. We've made an effort to make sure that they get the equipment that's needed. For example, this semester I have a blind student in my class, and we found a source for her to get a voice synthesizer, so she didn't have to purchase it. It was part of a vocational research package, and they provided her with the materials necessary to take the course. We feel that it's our responsibility to take care of those kinds of needs as well, and we're hoping in this way to get all students on campus more aware of how they can use computers.

Collaborative learning via electronic mail

I was very new at this when I started. I started using electronic mail perhaps a month before I taught a class for the first time using it. And at first I thought that we were heading for disaster, but I think in fact, that it was an asset, because the students didn't see me as the expert. I was maybe a little bit ahead of them in some things, but we were figuring things out together, how to use the system. And that helped a lot in establishing a sense of collaboration. I notice already that after one semester I have too much of the jargon down and I have to watch that, I'm becoming too much of an expert in the field. We're all starting at the same position.

This semester I'm using computers in a small seminar. There are 10 students, we meet once a week, and it's a 300-level course on social speech patterns. It's providing a basic introduction to socio-linguistics. We do a lot of collaboration in class, but I'm convinced that that collaboration works better because of the contact that we've had with each other outside of class. What I typically do is send a suggestion of a discussion topic for the week via e-mail. I normally post dates by which I want them to have responded, just

because everyone tends to leave it until the night before class, and then we'd have eight screens of mail which we don't have time to read. I normally ask them to log on at least 3 times in the week and check their mail and send mail. We've set it up so that we have a bulletin board, and anything sent to the bulletin board is received by the entire class. We also have individual ID numbers so that each person can send to a specific person or group of people; they're not obliged to send everything to me. In fact, I've encouraged them to use the computer anyway they want, and we always tell them that it's not limited to classroom use. I provide some basic guidance for our scholarly topic for the week, and I send assignments that way as well. Sometimes I don't even give the assignments in class. I just tell them to check their mail by Friday at noon. Sometimes I don't even warn them.

On the second page of your handout, I have an example of an assignment that I used last week. We were discussing gracis, maxims which are general principles that are said to govern conversations, and what I wanted students to do was to collect examples of violations of those principles. For example, the maxim of quality says that in effective communication, one of the underlying principles is that, in general, we only say things that we believe to be true. Of course, every time we lie, we violate that maxim, but the reason lies work when they do is that we have that underlying principle. Our expectation is that people will try to tell the truth. So I asked them to find instances of violations of all these various maxims and to post them, or send them to the class, and react and say how and why they would classify them. They had to collect eight examples. You see some of the shorter sample reactions. What I like about the comments is that a lot of them lead into other kinds of discussion. The examples from one student were drawn from the language use of her small children, and another student asked about the application of these maxims to child language. This generated more discussion and eventually led to predictions about frequency of maxim violation.

There's a lot of socializing that takes place, but there's also a lot of substance in what's going on. I very often get comments where someone is puzzling over some aspect of the reading or is particularly interested in something, and will ask the class for their thoughts. And then they'll get responses. I find that it helps me determine what we do in class. Things that I take for granted may generate a lot of uncertainties. It has helped me make class more appropriate. It's not uncommon for students to send me a note and say "I thought this article was off the wall. Why did you assign it?" Frequently, I'll let the notes sit, and let someone else respond, and often another student will point out some value of the article. I'm lucky in this particular group to have a lot of diversity in the class and to have a group that's willing to share life experiences in the course. For instance, I have a bilingual Cuban student, an older woman returning to school, a Black-English speaker, and a student with a daughter who is deaf. The blind student often gives us insight into how extensively we rely on our vision to communicate. She also has said that she never participates in class because she's found that class communication is so governed by visual communication that she was commenting at inappropriate times, but on electronic mail she feels perfectly free to contribute. She's much more vocal on the screen than she is in class, but it's started to change in class, too.

Those kinds of factors have been really interesting in this class. Electronic mail is a tool that in a good collaborative seminar is going to work well; the group is going to jell in certain ways. I think the process has been accelerated in this group. They're able to get to know each other better and a little bit faster, and a lot of this isn't public. If they want to send something private, they can. Unbeknownst to me, two people collaborated and worked out a fairly extensive project proposal through E-mail and then came and presented

their ideas to me, to find whether it was acceptable. So they see it also as a way to work together..

COLLABORATIVE LEARNING AND WRITING ACROSS THE CURRICULUM

Moderator: Jerome Harste (Education/IUB)

Panelists: Mary Anne Baker (Soc. Sci./IUSE)
Christine Farris (English/IUB)
Kathryn Wilson (Biology/IUPUI)
Gary Wyckoff (SPEA/IUB)

Jermone Harste
Professor of Education, IUB

JH: My name is Jerome Harste, and I'm supposed to be the moderator. I'm interpreting that role to include introducing the speakers. We thought we would have various people who are using the collaborative approach for writing across the curriculum give us a synopsis of the kinds of things that they're doing. We'll ask the panelists to talk for about 10 minutes and give us an overview. If the panel members have questions for other panel members we can engage in a discussion. If that format seems to be overly restrictive and you're just dying with a question, I think we're a small enough group to be able to accommodate that. We want to start conversation, not close it down. At the end of this period, we hope to make some recommendations both to university officials and to our colleagues. The first speaker today is Mary Anne Baker. She is in the Social Sciences at IUSE, and she has been helping students develop scientific writing abilities.

Mary Ann Baker
Professor of Social Sciences, IUSE

MAB: Thank you. The writing program that I want to share with you is one that we've been engaged in for some time on our campus in the Psychology Department. All the psychology majors are required to take an experimental methods course, which is a 200-level course. They don't always take it in their sophomore year, by any stretch of the imagination, but that's the theory. We decided, as we saw our students in the advanced courses perform, that their writing skills were deficient. And we came to believe that their writing skills were probably related to their thinking skills. We decided to rethink our methods class to focus more on the thinking/writing process. So we have limited our class to sixteen, and we have held our ground despite pressures to the contrary. In this class, we have three goals. We want the students to have a working knowledge of scientific method; we want them to increase their ability to think analytically; and we want them to be able to write effectively a research report following the APA style.

In teaching this course, I begin by lecturing on the scientific method, putting it into an historical context, a theoretical context, and explaining the meaning of terms. We talk about how you apply the scientific method in specific experiments. We then move to the next phase, where we give the students short summaries of research projects. They're divided into groups, and they work together analyzing short summaries of a research project, looking for the hypothesis, the independent and dependent variables, and the control variables. They then critique the design. They do this together for a week in groups that are formed and reformed. Following that, they have gained a level in

understanding the process. They've gone from receiving it to participating in it, and they realize that some of the things they thought they knew, they didn't know. They each have to do an analysis of five published research reports, following the same kind of format, and turn that in. When we finish that stage, hopefully they have a better understanding of independent and dependent variables and hypotheses, and a thinking style that is a little more analytical.

We then move to the third stage, the writing stage, where we do three experiments. The first two are designed so that the students are the subjects. They do analyses of the data and write them up in the APA format. I tell them at this point that they will not leave this class until they can write clearly enough to meet minimum standards, and that I will work with them until we are old and grey, if that's what it takes; or we can finish it within the semester. It's in their power to determine the rate at which this occurs. They begin writing the first paper and I work with them on an individual basis, giving them feedback, rewriting some sentences for them as aids, but limiting that until they get the first draft up to an acceptable level of format and they are saying things in coherent sentences. We then go to the second paper, where they are adding some sort of firm format, consolidating what they've learned. In the third paper, I put them back in groups to work collaboratively to design an experiment. In this one, the only limitations are that they have to design something that they can get finished by the end of the semester and that we have the equipment to run, and it must not require special approval from human subjects. They design an experiment with my help, put together their requests for human subjects, turn them in to the committee, and gather their data. I will help them with their analyses if they need it, because statistics is not a prerequisite for this course. Then they must write this up, having done the literature review and all that sort of thing in the APA format, and talk about the study and the process that they themselves have designed.

We require that all the psychology majors on our campus go through this process in some form or another. I wish that I could tell you that there's this miraculous outcome at the end, and the students stand out from everyone else when they have gone through it, but that's not true. On the other hand, you can often tell the difference in an advanced class between the students who have had this class and those who have not yet taken it. The students themselves come back, sometimes many years later, and indicate that they recognize the contribution that this made to their thinking and writing processes.

@: So they're all psychology majors?

MAB: Education majors who want their endorsement in psychology must also take the class.

JH: Kathryn Wilson teaches biology at IUPUI, and from what I understand she has taken several of the core courses in the biology program and worked writing into those particular courses.

Kathryn Wilson
Professor of Biology, IUPUI

KW: What we did was to take advantage of the money that the university offered for portfolio projects. We had developed the project earlier, but it seemed to fit into the guidelines of that particular program. What I want to do first of all is to read our rationale for this type of a project, which I'll just take from my grant. This was a collaborative

project with the English department at IUPUI, especially with Barbara Cambridge, who runs the writing center. She found for us a professor who was interested in working on this project and also had an interest in science. He helped us with the pedagogical aspects of this project, so a lot of this in fact is his thinking.

"A major goal of biology courses is to teach students to think critically about science. This requires the ability to read and analyze primary scientific writing, and to express analysis and critique clearly in writing. The ability to write requires the ability to think. And good writing itself reinforces scientific concepts by requiring complete understanding of the topic. Thus the purpose of establishing a formal writing program that is integrated into the curriculum serves the aim of each course by facilitating the students' exploration and discovery and communication of the basic underlying concepts of that course. Writing exercises address and advance the student's idea of himself, not only as a writer about relevant course topics but as a researcher discovering and controlling his own understanding of the topic and the process of writing about it. Writing functions as a means for the student to organize his thoughts, confusions, and questions and to work through these obstacles to understanding to a consolidation of meaning and finished thinking. Finally, the integration of writing into the curriculum assists the biologist to enhance the intellectual content of their subjects, thus humanizing their science, while at the same time, teaching communication skills invaluable to any endeavor the student may undertake in the future."

The basic purpose of our program was to extend writing throughout our core curriculum in the Biology Department. Biology majors are required to take four core courses, starting with two introductory course sequences that are absolutely integrated with each other. One is primarily cell and molecular biology with plant physiology stuck on the end and coverage of the plant kingdom, and the second one is ecology, evolution, the animal kingdom, and animal physiology. The other two core courses that are required of all majors are the lecture series in ecology and the lecture series in genetics. Our Bachelor of Science students also have to take the labs to those two upper-level courses, and we integrate writing into both the lectures and the labs. The culmination of the writing experience in our department is a requirement that all BS students enroll in at least two credits of independent research, where they have to go into the laboratories and work with a professor on a research project. Finally, they must enroll in one credit of senior thesis, where they write up their reasoning. Their senior thesis is the final insertion into a portfolio which includes the best writing that the student selects from each of the courses he takes.

The hard part of this was to figure out a design of progressive writing assignments so that the student started out with very simple assignments that taught him how to write clearly and concisely in scientific language, and learned how to use writing to help him understand: and then, to create assignments which taught him how to explore the literature, how to analyze scientific research such as variables, and so on--basically, how to think scientifically. In the first semester we start out with a very simple exercise: write a definition of one of the following terms. They're allowed to use only their textbook as a reference. You would be amazed at how many students don't even know how to do that. We give them a tour of the library, and we show them how to use bio-abstracts. We also require them to write all their assignments on the computer, so we integrate this with the computer literacy program at IUPUI. We use computer services at IUPUI to teach our students how to do word processing, and how to use e-mail so they can communicate directly with us about writing problems. In the second assignment, we ask the students to rewrite their definitions, but with reference to some papers that we put on reserve for them.

We ask them to stand back from those two assignments and say why those two exercises are useful. And we essentially teach them to say that to write clearly they must first of all understand thoroughly what their subject is about and then communicate clearly. Finally, we move on to teaching them how to understand what scientific literature is about, how to read it and summarize it clearly for other people, either for a lay audience or a scientific audience.

When they get to the second course, another series of exercises further develops the skill of reading and analyzing scientific literature. In the upper level courses, we have some rather interesting exercises where they must write about sets of data that we give them and analyze them with respects to certain keys. We give them one key, a statement about some scientific research, a logical hypothesis which can be eliminated on the basis of the information given. The student has to ask himself "Is it a logical hypothesis which is supported by the data? Can it be tested experimentally? Is it a logical hypothesis, but unrelated to the problem given in the statement? Is it a logical hypothesis but it can't be stated experimentally?" and so on and so forth, to think and analyze literature more carefully and more accurately. Finally, in the genetics course, they do an experiment and collect their data. They aren't given any clues about how to get into the literature and how to use it, but they have to write a complete scientific report about their own data. The senior thesis, then, is a much more independent type of project. Each member of the faculty deals with the senior thesis in his or her own way.

A number of problems have surfaced with this, because it's very difficult to integrate writing into every course exactly the way you want it. You have to get each instructor to give up what he's done before and substitute progressive writing assignments. Otherwise the whole program doesn't make sense. And we've had a little trouble doing that, convincing people that it's worthwhile. Secondly, we have not yet figured out how to assess the program. We know that the students like it. They don't resent these writing projects because we literally train them to like them, we tell them how useful they are at every step. They see the usefulness of the program, and they learn how to use it to help them study. So our student feedback has been quite good, but whether or not it actually helps learning is the ultimate question.

JH: Gary Wykoff is from SPEA and he has been working on intensive writing, using lots of short assignments that take the students through the process several times. The other unique thing about his program is that they're using their Ph.D. candidates and people from different programs to work with undergraduates.

Gary Wykoff
School of Public and Environmental Affairs, IUB

GW: I'll expand on what Jerry said and then give you three ideas for collaborative learning that have come out of this experiment. What we're experimenting with in SPEA is a collaborative approach where we hire English Ph.D. students to work with faculty members to design assignments that will both serve the needs of senior seminar classes for our students and will also try to improve their writing. We hire English Ph.D. students, we christen them "instructor," and we work with them to design four or five short assignments; we have a class of 65, so it can't be too many. Normally, we begin with a simple descriptive paper with the directions to explain something clearly. Towards the end of the semester we assign persuasive papers; "Try to persuade someone to your point of view using logic, data, expert opinion." Both the writing instructor and the faculty member

grade the papers, and both the faculty member and the writing instructor give presentations of common mistakes in them. The faculty member is supposed to talk about content and the writing instructor is supposed to talk about writing, but there's no easy division between the two, so they both talk about various aspects of the papers. That's the structure that we've been working with at SPEA, and it works pretty well. We've had an outside analyst look at the papers before and after the seminars, and he's said the papers have definitely improved. And students admit that their skills have improved, although they don't necessarily like the assignments.

I want to emphasize three ideas for collaborative learning that you might find helpful. One is the collaborative teaching aspect, where you are collaborating with someone who is from English--I think this is a really beneficial thing. The English people really do know more than we do about writing. I've learned a lot about writing from them, and I think that they've learned something about the topics that we teach from us. That works well, although we've had one faculty member who sort of subordinated the English Ph.D. students and didn't give them full partnership in the exercise. He refused to allow the student to do the grading or design the assignments, or to give complete expression after the assignments. And that didn't work at all. So I guess the message is that each member of the team has to have full representation.

@: That didn't work? Will you explain that again?

GW: Well, we had one faculty member who agreed to use a Ph.D. student, but it turned out that he had his own ideas about what writing ought to be and what good writing looked like, and he really wanted the Ph.D. student just to make a few comments on all the papers so that he didn't have to go through and mark them. He didn't really allow him to design the exercise, speak in class, or take time to explain what's wrong. And he didn't allow the student to share in determining the grade, which I think is important.

#: In what context are you using these assignments? Is this a seminar course?

GW: Yes, it's a seminar course on agricultural policy. We've also tried it with our graduate students.

@: And does this occur in only one course?

GW: We've tried it in three different courses so far, all upper level. It might work better to do it earlier in the student's career; it may be too late by the time he or she is taking the senior seminar.

The second thing I wanted to suggest was a collaborative exercise. The main problem that we find with writing is convincing students to rewrite. They want to take it out of the typewriter and hand it in. So we give them a very simple exercise and fifteen minutes to write it in class. They hand it to a person in the next row, someone they may not necessarily know, and that person has fifteen minutes to comment on it. We give them a very detailed set of things that we're looking for, whatever we're working on: it could be incomplete sentences, or run-on sentences; it could be lack of introduction or proper conclusion; or it could be vague references. Then we hand the paper back to the first person for another fifteen minutes, during which time they clean up any problems. When they turn it in, we grade it based on both the initial paper and how much they managed to improve it over the period. I wouldn't say that this idea is a panacea, because some

students reviewers aren't very good or conscientious. But I think it's a good experiment to try with your classes because it gets students into the idea of "Oh yeah, it's natural to have someone look at it, it's natural to have to rewrite it, it's natural to be thinking twice about a paper." That was a suggestion of one of the Ph.D. students.

The last collaborative technique that we use is the debate. And here we may have an advantage, because there are always controversial topics we can debate in SPEA, but I imagine that there are other controversial topics. The way this fits in with writing is that debate is a group activity and they are graded as a group, but they have to write an individual brief for the debate and that is graded individually. This way I know that the student is prepared for the debate and that every member of the team can contribute something. That combination of individual work and collaborative work works really well for us, and it might be something to think about.

JH: Our last panelist is Christine Farris, and she is half-time coordinator for IU Writing Center, or something like that. What is it called?

CF: It's the new Campus-Wide Writing Program.

JH: As you know, our university has really taken as its thrust to get more writing going across this campus, and this program was created to that end. Last year we interviewed people from various places for this position, and the University of Missouri, where Christine is from, is one of the first universities in the country that took writing across the curriculum seriously. They invaded lots of other disciplines with writing. I'm really looking forward to hearing what kinds of things she's found that work, and what recommendations she has.

Christine Farris
Campus-Wide Writing Program, IUB

CF: I'm kind of speaking with two hats. I naturally got involved with collaborative writing in English, and I still do that, but my research specialty is how different disciplines use writing in courses other than English. So I've found out a lot about what happens when you parachute writing and even collaborative writing into courses that are already in place.

I guess that the first place where my interest centered was in the area of composition. That involved, as a lot of you know, a lot of small group work on drafts, made popular by people like Peter Elbow. I continued to use those strategies in my writing courses, and I trained graduate instructors accordingly. I've since changed my philosophy. When it was first popular, it involved listening to other people read their drafts, and then you simply jotted down things you liked, things you didn't like and things that you had questions about. One thing that I found both in English courses and those in other disciplines was that there was just too much going on in a paper, the text and so on, to listen without criteria for that specific paper. So I started coming up with criteria sheets that made students do something with the other person's draft. They were forced to go through it and ask questions at each paragraph like, "What's it doing? What's it saying?", or very assignment-specific criteria, such as "Has this person gone beyond summary to analysis?" They finished by writing a response to particular questions and giving it back to the peer, partner, or group member. That's a real change in my philosophy, and that makes me an unorthodox peer writing person in some ways.

The other way I use a lot of group work is in literature classes. One of the justifications for using collaborative work is that it initiates students into the discourse community; the interpretive community, but I only buy that justification in part. I think that we still need to teach them how to use the tools of our discipline and how we interpret in the case of literature, how we analyze. So I'll put people into groups with a draft that's a response to a short story or a passage or something, and I'll say, "Now you're going to revise your draft overnight, from another perspective, from another group member." Another way that I'll do that is to provide the tools. Together they'll work on describing what's going on in the passage, and analyzing it, and then earning the right to evaluate it. This moves them beyond the "I like it/I don't like it better than mine" reaction to drafts to which students usually resort.

My third phase of interest comes from being a consultant and a researcher in cross-discipline writing programs. Whenever you're looking at the instructional use of writing, you're engaged in examination of the whole culture of a classroom: how knowledge is established and challenged, in a field or even in a particular course. I think that collaborative writing and writing share some of the same problems, and you can't just drop them into a course without rethinking its goals. Probably all of you have been in the situation where someone has said "Add two papers to your course, please." And you still have stuff you have to cover, and you still have quizzes in the course and so on. I think that adding both collaborative activities and writing activities means sitting down as a consultant with the biology person, or the psychology person and saying, "How would writing fit with the particular course goals? What would you want the students to know at this particular point in the course, that a particular type of writing assignment would address?"

The biggest thing that I've noticed when we've talked is that an instructor has to give up some authority in the transmitting of knowledge. Many times it involves rewriting the way that they give out an assignment. When I collect assignments on campus, and I'm doing it again here, I see how the product is supposed to look. I could almost erase the department heading from the top, because a lot of the assignments are not discipline-specific enough, they're not assignment-specific enough. And so I'll say, "What processes do you want students to be going through, that this paper will be a reflection of?" not "How do you want this product to look?" Then, if the students are going to get in groups or look at each others' drafts, share those criteria with those groups or with the peer partners. See if people are doing this now. In political science, if you want people to move beyond the idea that fascism happened once, and never again, you're going to have to build that into your criteria. You can't trap students later on and say, "This was a superficial treatment of Hitler," or something like that. You have to say that you want this sort of thinking going on; if they're sharing drafts, help them help each other, and push that thinking where you want to see it going. My biggest recommendation, and the thing that I'm always working on, is helping people rethink their courses, and the kind of learning-to-write and writing-to-learn that they want to have going on simultaneously.

Writing to learn: Revision skills

JH: We're supposed to talk among each other and ask questions. I have one and since I want to make sure it gets in, I'll start. Christine, one of the things that we've learned is that

writing is a tool for thinking, and a lot of these people are using it in the old way, exactly the way we don't want them to use it, as a test. They're using it for the purpose of getting a good final project and to catch people's faulty thinking. This has always been the problem with writing: you leave a visible trail, you're vulnerable, and people can always jump on you. What bothers me is, how do we move away from that? From the standpoint of our discipline it isn't doing us any good. Do you know what I mean?

CF: I think that you've pointed to the biggest shift in mind-set that writing-to-learn people want to have take place. And Gary, you've pointed to part of it; writing is revision. If disciplined people will build in assignments that can be revised, whether it's with the peer's help, the writing center's help, or our help, or the tutor who's assigned to the course, that's where the learning is. Writing-to-learn people view the process as equally as important as that battleship term paper at the end. But it's the behavior that it is hardest to change. People think that all writing that goes on the class has to be graded. I'll say, "You have to think a little bit more about the kind of writing that's for the student's benefit: entrance and exit slips, ten- or fifteen-minute writings at the beginning or ending of class to kick off or wind-up discussion, writing that you may never see as the instructor." Or smaller assignments that build on each other.

#: You can't have students write about a topic and then crush it. It kills them. Because their notion is that if I ever write anything we should publish it someday. I want them to understand that writing is a tool for organizing your thinking. It's a way of setting down random thoughts and then rethinking them. One of the things that I do is, when students are reading, I'll have them do a free-write. And they share in groups their free-write, but we don't take that to publication form. I'm more interested in getting them to think of writing as a tool for learning, and getting them out of the notion that they have to do it right, and maybe starting some conversations that may lead them to writing.

KW: In the first three exercises that we do in the first course, we're at least trying to do that. And it works pretty well, actually. We've been lucky that we've been able to hire an English instructor to work with us this entire academic year, and he starts off by having the students write definitions. I always thought that if you ask a student to write a definition that they would sit down and write it and it would be right or wrong, and that students naturally knew how to do this. But then somebody asked me for special credit one year, and I said, "All right, I'll put up some terms that you've never heard of that are related to what we're working on." They had no idea of where to start, how to start or what to do. They were intelligent people, including juniors who had taken English composition, but they couldn't write a definition of a term. They didn't know how to start. So that's the first thing that the English instructor did. He gives them a term in science that no one understands, something hard to define, like "entropy." They just sit down and they write everything about entropy that they can think of. They can use their textbook and write down anything that is related. We have them draw entropy in the middle of a circle, attach to it everything that could possibly relate, and then just write anything about it for three minutes. They're shocked when you tell them to sit down and write about entropy for three minutes. Pretty soon, they're all scribbling something. And the next part of the exercise is that they should take what they've written and revise it. The instructor has written a very clever piece on entropy which needs drastic revision, and he talks about how to revise it. "What's wrong with this sentence in particular? It's circular. What's wrong with this sentence? It has inappropriate terminology. It's not scientific, it's something that you would put in a philosophical definition, not a scientific definition." We talk about the appropriateness of the definition to the subject. And then they go off and they write a

definition, and they come back with incomplete sentences--for instance, if they have to write the definition of osmosis, they come back with "Osmosis--(dash) a special case of diffusion.(period)" They'll say they didn't know that they had to use good English. These kinds of things just astound me. The second assignment is "Now go back and revise this," only this time we give them a paper they can read. They read simple, well written scientific papers, secondary or primary literature, it doesn't matter, that are fairly understandable. They read these and then they have to incorporate this paper into their revision. It's the first time they've read a scientific paper and they can't understand any of it, and they get all upset and say that they can't possibly understand it. So you have to spend a lot of time with them and show them that they can understand this paper, and tell them to read the abstract, which will tell them what it's about. You have to spend a lot of time with them.

Scientific versus humanistic language

#: Why would you use English people? I've heard you all talk about thinking and using scientific language.

KW: Because they know how to teach writing, and we basically don't. When I first started teaching this course, I had them write lab assignments, lab write-ups, for really simple little things during the first semester. What would come back was first of all, not English, and secondly, so garbled that I couldn't figure out what they were trying to tell me. And I didn't know how to deal with that.

#: My thinking is the opposite of that. It never occurred to us to go to an English faculty member, in part, because it's my experience that scientific writing, when we get beyond sentence structure, has a different enough set of goals that I didn't expect that to be productive.

KW: We decided that the goals were the same across any subject, namely, to communicate the subject clearly to an audience. There may be things that are specific to scientific writing, but that's mainly terminology. The communication process is basically the same.

*: I guess that one of the tenets for writing across the curriculum is that you can't make a split. It's good that you pulled it together.

KW: We didn't do it by ourselves; the English people pointed it out to us. When we called them up, the first thing that we were asked by Barbara Cambridge in the Writing Center was, "What is your goal?" And we said that we wanted our students to be able to write clearly, and we wanted them to be able to use writing to help them think. We didn't want to just dump a writing assignment onto my class; it's a hard course already. It had to be used in such a way that it helped the students learn the material, otherwise it would be irrelevant.

*: I guess that I'm being humble about what we know; you know so much more than we do about your content, and it shapes many things about your prose, not just your style, but the degree to which we can get engaged in your papers. Most people can collaborate with you and become very immersed in your course, but to a point.

KW: But the first six exercises that we use in the beginning course were just invaluable, because we have to assume that we're starting from scratch, that the students don't know how to write very well, or how to communicate their ideas. You have to start out by

teaching them to define a term. We picked terms that we are discussing all the time in class. And then we have to teach them how to use the scientific literature, to say more, to be more complete, and at the same time, to impose upon them a scientific writing style which, in my opinion, should be very concise and to the point. I said this to the English professor, that the writing style shouldn't be poetic: and he asked why not. And I really couldn't answer that. You have to read so much as a scientist that you don't want to wade through an extremely creative way of putting something. You want it said straight out.

*: We often need parallel construction so that clarity and the parallelness of ideas are there.

KW: I think, actually, that he convinced me that there's a place for poetry in scientific writing.

Persuasive writing

&: Well, I would also argue that there is a developmental process where description is the first thing you have to master, and then you might handle the persuasive if you've got the descriptive down. But that seems to be the building block for us if the students ever want to explain something clearly.

KW: We have that component, too. In the fifth exercise they have to read a paper on photosynthesis, and then they have to use that paper in a discussion which is written for a particular audience, say a congressional panel of congressmen who are trying to decide how to spend agricultural money. Why should they support this kind of research? They have to persuade the congressmen that it is worthwhile. They can use that paper and any other paper that is in its bibliography.

%: In the research now on writing they say that kids learn to write what they have a lot of experience with. One of the principles coming out of the writing, learning, and language movement is that if you want the kids to sound like a lawyer, have them hang out with lawyers; if you want them to sound like a teacher, have them hang out with teachers. This would mean, in your instance, if you wanted them to write a certain kind of paper, a persuasive essay, then a more efficient way to achieve that, rather than a series of writing exercises, might be to put together a collection of readings, different types of essays, and to talk about those readings and familiarize the students with the kinds of stuff that goes into a persuasive essay. Do you know what I mean?

KW: But you see, we're not so interested in having them write a persuasive essay as having them look at the science in the paper, decide how it applies and write about that. In other words, we find that students who take biology think that a lot of the research that goes on it totally meaningless. They don't see any relevance or any application. We make them have to persuade someone important. And we give them a paper which isn't at all persuasive, one that is just straight research. Why do this? We're interested in teaching the students to look at the science and to communicate why it should be done. It's the communication, more than the persuasion, that we're interested in, because we work on the scientific aspects of that later on, where they have to present data and the data has been persuasive.

Starting points

*: It seems to me that every kid would have to know a little about agriculture. I may not be your most brilliant student, but if you probe me, I certainly have a little agriculture in my background, and a little biology, probably just enough to be dangerous. As a teacher, you have to start with what the kids know, don't you?

#: I didn't lay out every detail of what we do, but for the first assignment in the class the students are told to pick out two articles from the literature, anything that interests them. We begin by summarizing those. I hadn't really thought about why I do that instead of assigning a particular topic, but it starts them at a place where they're interested. The next thing I do is immerse them in an area, making them read the literature in a particular subject and bringing them into that subject matter. In other words, I don't stay with what they know, but I start them there. Then I define a domain for them to be knowledgeable in and force them into it. I work with them, and then everyone is in the same domain. I've gone into their world, but then I've forced them to come into my world, my world being the level of what I want them to know in the process.

Use of computer technology

JH: I think we've learned some interesting things about learning and the role played by writing. I don't know that any of us currently knows how to do that. We're experimenting. One thing you were talking about is having computers available. When we were studying proficient writers, we found that we were having them do what no writer in his right mind would ever do. Writers write with computers; they don't draft stuff out. To a large degree, we haven't had those facilities available for students so they can compose.

@: We force our students to do it, because everyone in our department, for instance, writes on a computer. It has its problems, because we have to start by getting these students into word processing classes, and we don't do that. Computer Services does, and they do a pretty good job of taking students in clusters. They come into my class, and they sign them all up. The students are required to go, and Computer Services takes attendance. In the computer clusters, they have a nice big screen, and they sit the students down and show them how to use it. Every student at IUPUI pays a technology fee, as they probably do at IU, and they have access to all the clusters. We used e-mail for the first semester with the K101 students. We had simple exercises in the beginning, such as having to send me a message. That is really a big deal for them; it's hard to use e-mail. And we want them to get used to using the mainframe. The very last assignment will be written on E-mail. Now that's not a good word processor. We'd like to use something else, but right now there's nothing else available. It's a way of forcing students to learn how to use it, by letting them know that they're going to have to write and assignment and they'd better start practicing. In the upper-level courses, the professors are using e-mail a lot for question and answer. You get 21 letters, responses--it's a lot of work.

@: Can you get more than one address, to keep mail separate? We're just setting up this system on our campus.

&: I have 150 students, and I don't find it that bad. Some of them are still afraid, and when they get on they write a little message that says "Well, thank goodness I finally got on this thing. It took three tries. Glad I'm here. Bye." And then I reply "I'm glad you're there. Bye." So it's not that big a deal, but it has been very difficult for us to set up the E-mail portion of it, because students aren't getting their ID numbers in a timely manner and making it to class. So I had to have class in my office.

Grading and evaluation

#: What is your advice for professors on this campus thinking about writing? What do you want to warn them about? What do you want to recommend?

GW: I think it's an excellent thing. The university has short-changed the students on writing. But I would be careful because writing will not make you a popular person. Students don't like it. You have to be careful how you put it to them, and they often will take your comments personally. You give a student a C on a test, and it's no problem, they whistle their way out the door. They get a C on a paper, and that's a personal thing, and it takes some tact to do it.

@: We've been talking about the problem of getting students to realize that revising is an important step in the process. They don't understand revising, so at 10:00 they're typing away like mad and ripping it off the printer. I feel that this semester we broke some of these traditions. It's had a tremendous effect on me, because I can read a paper that's lousy and I can give this paper an F, because they can revise it, and every time that they revise it, I will give them another grade. By the end of the three weeks, they may have revised it four times. And by the end of the session, you don't have to make the corrections for them. You can say, "Does this sentence belong here? Is this the correct punctuation?" You give them questions to think about. I haven't had students break down in class because of a paper they thought was an A, because they know they can revise it. It relieves a tremendous amount of pressure, although the degrees differ.

*: This is the premise on which the class is based. I refuse to give them a letter grade until they have reached a certain level of proficiency. It's part of the motivation for them.

%: How many classes do you have?

#: I have two classes of 22 and 23, then. . .

%: So you have about 44 kids rewriting. And that doesn't overwhelm you?

#: No, because proficiency does not come in all at once. And I don't collect the next set of papers until the period's over. Some people will hand in a revision the very next class period, others will wait. It's really quite spread out.

@: I see problems with the flexibility of this.

*: Our system is going to be hooked up so that students can use remote sites and I can take it home. It can use any system at all; it's not dependent upon any particular one. It's not operating today, but the software is being produced, so the remote site is the second phase. They promised me that before the end of the year, perhaps this semester, we will have the set-up that can be used anywhere on campus, and they can dump it into a site for me.

Grading and evaluation: The student's role

#: I'd like to make a suggestion in light of our topic, collaboration, and that suggestion is, take the burden off us. Place more of the responsibility on the students. This is why I insist that the assignment sheet, the peer feedback sheet, and the grade sheet continues to pick up the threads of the criteria of the paper in my upper-level classroom. Students in advanced writing courses are increasingly responsible for each other's drafts, and I want that critique sheet attached to the paper that was critiqued. If this is a crummy final draft, and you as the critiquer looked good, they I don't see a problem affecting your grade. I want them to work as a community to try to improve these particular skills.

%: What about the load on the student when you add this to them?

@: I keep asking them if it's still a valuable activity. There's quite a difference between asking freshmen and asking seniors. The freshmen don't have the tools yet to help each other, but the advanced students say that they see in each other's drafts the problems that they have, and when they can help each other they're making things clearer for themselves.

*: I think it's got to be shot through the whole class. I'll start a unit by writing a summary together in a group. They will function as a group and reinforce the idea that this could be better and help each other make a first attempt.

#: What do you do with the undergraduates, who are not equipped to evaluate with a critical eye?

$: I think that you have to model what the interpretive community looks for before you put anyone in groups. I would give them draft examples from the previous semester, and work through the definition together and go through it. They hear me saying "Now here's what I'm seeing. This is what's bothering me. This is why this is a C paper."

JH: I think also that reading and writing connect. Kids pick up on different demonstrations from reading of things they're ready for. They may not see, in a well-written essay, everything that you see, but they tend to know the things that bother their writing and things that they think they're having trouble with. The other thing I find with undergraduates is that they'll say to me, "I never got to read anyone else's piece. That was very informative. No wonder you liked Adrianne's piece. I liked Adrianne's, too." I think that just having their hands on five or six other people's papers give them a sense of standards. I see standards evolving just through their reading of each other's work.

%: When you say that you identify the criteria for them, do you mean in terms of a pre-existing list, as opposed to talking it through with them?

#: I think that if I was going through a paper with the assignment sheet in hand, that I'd be saying, "Look at how this paragraph develops to support a point. Look at this paper to see how the generalizations were never backed up and never moved to analysis." Because they'll ask what you mean by analysis.

@: When the students are doing all of this on the computer, how did you logistically involve them in collaboration?

JH: I don't do it on computer. I don't even read my own articles on the computer; I can't see anything wrong with them on the computer.

#: It was popular for awhile. I know they used commenting, with other students coming in and adding comments.

$: There's a real problem with the technical types of writing. I know our screen can't handle some. . .

JH: It's time for our break.

[The following recommendations were made at the conclusion of the panel and discussion.]

1. Writing across the curriculum needs to be funded outside of particular disciplines. Rationale: Under responsibility-centered budgeting it is unlikely that departments will spend monies to improve the quality of existing courses. Outside funding for writing across the curriculum needs to go beyond seed money. Departments already know it is a good idea. What is needed is financial support over the long haul.

2. The university needs to encourage as well as support cross-disciplinary work by faculty in the areas of collaborative learning and writing across the curriculum. Rationale: Writing experts and discipline-based faculty need to work together to think through how best to use writing to improve the quality of undergraduate instruction. Grading and the evaluation of writing are major concerns of discpline-based faculty. Collaborative techniques for using writing as a tool for thinking in disciplines need to be developed and tried.

STUDENT-ORGANIZED COLLABORATIVE LEARNING

Moderator: William Lynch (Education/IUB)

Panelists: Holly Gurney (English/IUB)
Hester Hemmerling (Education/IUB)
Robert Huggins (Teacher Ed/IUPUI)
Mary Johnson (Business/IUB)
June Rimmer (School Principal/Indi.)
Edward Robbins (Teacher Ed/IUPUI)
Elizabeth Snoddy (Teacher Ed/IUPUI)

William Lynch
Professor of Education, IUB

WL: Holly and Hester are members of a group of graduate students doing collaborative research here.

Hester Hemmerling
Graduate student in Education, IUB

HH: We were encouraged to develop a research topic that was of interest to us--that's how this collaboration began. We discovered that we shared an interest in the same text. We began to look at our thinking in a slightly different way, to examine our connections, how we constructed meaning, and how we might look at ethnographic techniques that those people list in their concerns, to look at teachers.

Holly Gurney
Graduate Student in English, IUB

HG: I think that one of the things that helped us was that first of all, we liked each other . . . we looked forward to exchanging our ideas. Another part of it was that most of us came from similar areas of discipline. We had been trained in similar ways. Mostly we shared our gender. It has been suggested that there are women's ways of knowing, and the question arose, is there some particular way that teachers have of knowing? And we felt that chances were, there was, and that having conversations with these teachers would give us more awareness of that development. And how they were able to articulate their thoughts and feelings, their way of knowing. So we went out, as a group, each emerging with different sources, and we have pushed barriers both in research and in terms of collaboration. We talked with everyone from established college professors to people who were brand new. We interviewed both men and women, however the data collected was all from women. We went out and had conversations. In the beginning we didn't necessarily have a clear idea of where we were going, or know what we wanted to do. But the data that came in was voluminous and magnificent. After we did that, we worked with the respondents as equal researchers, and did member checks to classify the respondents, determining what was and what was not to be considered data. We sat down to analyze the data, and since then we have been pulling out strands to initiate and renew ties with the respondents. The other very important thing in our project was that just as we had been interrogating the information and resources, we did the same to ourselves, both as teachers

and as researchers. So our methodology has been of prime interest to us, and as we write up what happens with our respondents we do the same things to ourselves in all of our meetings, and that in turn becomes part of the data pool. We try to analyze the conversations, and we find that has become an important part of our research.

HH: There's always the real danger of, when you want people to understand . . . using a very simple but very powerful research technique, and you get to watch ourselves collaboratively, and that's astonishing. So we were getting told all our lives, sink or swim. It was wonderful.

HG: It was a process of discovering a new aspect of your identity. And it was reflected with the respondents.

WL: It occurs to me that it might be more productive to to have questions after the end of each section rather than wait until the end. So let's open this up for questions now.

*: What makes the collaboration effective?

HG: What has made this collaboration effective is that we have benefitted individually from this, and brought in our own backgrounds. For example, one of the teachers that we talked with was claiming that she learned from another who was more experienced. And so each of was able to maintain an identity, and yet each of us had a function or part, mainly because we shared the same interest or goal. I don't know about the interrogating--we tape everything and Hester did most of the transcribing. Seven days later we can see on paper just what happened at our research meeting last week and take the time to digest that, and it blends in very nicely with the next meeting. It's a very practical way of looking at ourselves. It's very revealing to look at yourself on paper--there have been times where I haven't recognized what I've said. It's very revealing to watch the process of how you were thinking and how you've changed.

HH: It also liberates us from having to take notes. It sounds simplistic, but it's difficult to take part in a conversation when you're reminding yourself what so-and-so says, and the meaning changes in the act of writing it down. This way we feel like we fully participate rather than trying to chronicle.

*: You become a part of the interview, rather than being the interviewer.

HH: Yes, and that is so tightly connected with our assumptions that knowledge is socially constructed that you can't really consider it otherwise.

*: Why did you use only the data from the women's interviews?

HG: The two men chose to drop out. That was one of the difficulties with the questionnaire--what do you do when you have respondents and all of a sudden they choose to withdraw? We had decided from the beginning that we would be to be sensitive to the respondents' wishes, and should they wish to drop out and take back the data, we would weep a few tears, but we would willingly give it back. In our first round of conversations, there were two men who had volunteered to participate, but they decided for whatever reasons to withdraw.

*: Could you talk for a moment about the social particulars?

HG: I could start from a theoretical point of view, citing people like John Dewey, for example, because he comments so much on education. But it's basically the notion that everything that you know and that you are is a conglomeration of what's around you. Of course, there are lots of people around who will refute that. There are the concepts of individuality, and genius, and the American ethos of what a country is built on--a whole host of objections. But we find, especially in research that the dynamics are very real. We see that all six of us are the product of certain beliefs about education and how you learn.

HH: Here's a different angle. What we're experiencing right now in the school of education is the conflict between two ideologies which are mutually incompatible. On the one side you have people who say that learning is a product of transmission, and on the other side you have people who say that learning is a process into which we are so integrated that we cannot totally separate learner and teacher; we cannot separate the learner and the learned. We have a relationship to what we have learned, in our epistemological perspective, that says certain things about who we are. The people who feel that learning can be transmitted tend to broadcast information, and feel that there is some kind of magical information processing that happens when your sensory perceptors are stimulated in some way. New information comes in, and then you go through this binary operation where you integrate this new stuff. At the other end of the spectrum are the people who feel like meaning doesn't just exist unless we make it.

HG: In terms of our research, one thing that I think is important is that we went out to have conversations with our respondents. We did not set out with a list of questions. It was not a formal interview, but rather a conversation, which was, on the one hand, wonderful, and on the other hand. for several members of our group, somewhat scary, because we made a point of maintaining that conversation. That meant not playing the part of the researcher, but of a teacher, a fellow human being who is vulnerable within the conversation. In retrospect what we found was that not only did the people we were speaking with learn, but we learned a great deal about ourselves, about the study and that sense of vulnerability. It was the social interaction of the conversation between one of us and the respondent that began to generate a lot of information.

WL: I hope that we have time to come back to this. I have other questions, but I'd like to turn next to Mary Johnson who is an MBA student in the School of Business. She is working with a peer tutoring system in the School of Business.

Mary Johnson
Graduate student, School of Business, IUB

MJ: What I'm working with is a position of graduate assistantship. This position has existed for six years. A minority MBA student is chosen as the coordinator for the tutoring program. This involves finding about six MBA students to tutor undergraduate students who are taking courses in the Business School. We do not limit our services to undergraduate business students, but any minority student who is taking a business course. Our reasoning is that the Business School is sometimes seen as a rather closed community, so when we have other students coming into take business courses, many times they are shut out by their peers. We want to give them the opportunity, first of all, to interact with the graduate students. Also, in many cases we end up tutoring more than one student at a time and informal networks are established in that manner.

We tutor basic subjects: economics, accounting, computer science and business law. We are tutoring the students, but as graduate MBA students, we're also serving as a role model for them. Many of us were undergraduate business students, but even if our degree was in another discipline, we went through the same types of things that they are experiencing. For example, the situation of being in a classroom, being a very intelligent person, but lacking the exposure to certain things that other students have had. In an economics course, you need to have a very good grasp of algebra. Many students come to us not having had an algebra course, or they've taken it at the collegiate level and passed the course without integrating the subject matter. Therefore, they're in the economics class and they don't know what's going on. They're afraid to ask questions, because they don't want to seem any less capable than the other students. Many times that fear is transferred to the professor, and the students are reluctant to go to the professor for help. We are there just in case they have problems approaching the professor or other peers in the course. However, as tutors, we always stress to the students that we are not a substitute for their professors, that they need to speak with their professors at all times in order for that person to know where they are on the spectrum of learning.

The tutoring is not limited to academics. We do some "peer counseling." If they are having problems, again, they are more apt to come to us than to go to their counselor. We help them in any way possible, but we always encourage them to see the professionals because we are students ourselves. That's where some of the difficulties come in. In making up our tutoring schedules, we try to make them as convenient as possible, but since the MBA students have classes also, sometimes our hours are not as flexible as they should be. If the situation arises where a student cannot get to us during our tutoring hours, then I find that as a tutor, you make concessions. You come in on a weekend to tutor. Whether you get paid or not really isn't the issue. It's much more than a job, it's our opportunity to give back. Number one, many of us are at IU on fellowship--some of you are familiar with the Consortium for Graduate Studies in Management fellowship program that basically pays for minorities to obtain their MBA degrees from IU. Most of us are on financial assistance. Something has been given to us, and in turn, we want to give something back. We also can remember what it was like to be sitting in a classroom and not know what was going on, or simply being afraid to ask questions.

*: Can I ask about the context in which you are doing this? Is this basically a one-on-one meeting with the students? Or are there other ways that you are meeting, such as small groups?

MJ: Actually, it's a mixture. Our tutors have office hours and as the students come in, the tutors address their needs. If you have students come in needing help with the same subject area then you really try to encourage them to work in a group and you address the group as a whole. We also try to encourage the students to meet again amongst themselves. If they need the tutors there we'll try to arrange that.

*: How many students are being tutored?

MJ: That's hard to say. Our service is open to any undergraduate minority student who is taking a business course. Typically, your better students take advantage of it and the weaker students do not. I would say that we see about fifty-odd students each semester. Before a test you might have a group of five at a time. Although we are there for minority students, if a white student were to come to us, we would tutor him or her also. We do not exclude non-minority students, we simply do not advertise the service to them.

*: What sorts of reactions do you have from the students? And I'm interested in the ethnic breakdown of the students, Hispanics, etc.

MJ: The students really appreciate it because again, many times, the professor is speaking on a level which the student cannot comprehend. They come to us and we simply break it down. "This is what the professor is trying to say," and the lightbulb goes on. They appreciate us being there. I've built up many friendships with undergraduates that I see all over the building, and it's great because we ask how classes are going. I see it as an even exchange of information--I'm not going to dictate to you what you should be taking, I'm not the master of knowledge, I'm not above you. The fact that you're coming to me for tutoring is not a sign of weakness, not a sign that I have some power over you, but there may be some things that I know that you need to know, and there may be some things that you know that I need to know, so let's listen, and exchange, and we'll both learn.

On the breakdown of students, about 70% are black and about 30% are Hispanic. We have Hispanic tutors also. I haven't seen Asian students come in.

*: You spoke of your relationship with those you are tutoring. What about your relationship with your fellow tutors? And what classes are the students seeking help in?

MJ: There's an even broader program that umbrellas this program, called the MIBP, the Minorities in Business Program. Through that program the students are paired with faculty as their mentors. Mentors, students, and tutors meet as a group informally. We have built up relationships with the professors in a limited sense. We may not know them as well as we should, but the door is always open for us to go to them for help. For example, if a particular student is having difficulty in a course, the professor may be approaching it in a different manner than the tutor is accustomed to and the tutor can go to the professor and is given support. We try very hard. We never contradict the teacher. What is going to be on the test is what the teacher taught.

*: Do some of the people involved chafe under that restriction?

MJ: Not at all. I guess that we've been brainwashed to a certain extent. We're MBA students and we're used to writing down what the teacher has said.

*: One of the things that the program lists as an objective is to make the students aware of the corporate community by sponsoring students to corporations.

MJ: Through the Business School, we have week days where corporations such as AMOCO that will sponsor two or three students to come up for a day, "shadow" a professional in the area that corresponds to the student's discipline of study. For example, we have three accounting students that will be going to AMOCO in late October to actually sit with accounting professionals for the day. And we also have corporations come in and make presentations to the students, typically presentations concerning recruiting.

*: What about the collaborative processes? What do you see the students bringing to it? Tutoring would normally be a mentoring relationship. Do you see students bringing anything to this relationship besides need?

MJ: I think what the students bring to the relationship is a different view of the Business School. You'll find that in the Business School, undergraduates and graduates have totally different perspectives of what is going on. The undergraduate business program is extremely competitive, so the students bring to us and to themselves the realization that they really are trying and that they have the skills necessary to do well in the program, but there are some outside pressures that they have to deal with. Given that we're only here for two years and they are here for four, there are different types of things relative to the community that they can teach us.

*: Are there ways for you to pass on this experience: the information that you glean from interacting with them? Are there ways to pass that on to the faculty?

MJ: Marie Muller, Director of Student Affairs, is my boss, and I have meetings with her where I pass on information. The tutors as a group have meetings with Marie, and we pass on the information to her. But as of yet, we have not directly passed it on to faculty.

*: You mentioned that many of the better students come to you. What have you done to encourage the students who are struggling to come?

MJ: We have informal pizza parties, things of that nature, and we have rap sessions with the students as a whole. During those times we stress to students--we don't single them out--but we tell them that if they need this service they should come. Many of the students that are coming now are doing very well. They're all very bright, but those who are coming have an edge. We try to build up a friendship, a network, in order to induce them to come see us. Many are afraid to come to us because they see us as the mighty all-knowing MBA who is different, in the same way that they fear their professors at times.

WL: We have one more set of panelists, then hopefully we'll have time to open up for further questions. The three people to my right represent IUPUI's Project Teach.

Edward Robbins
Coordinator, Project Teach, IUPUI

ER: Let me give you a brief background on Project Teach. I'm not a student in the program, rather I have the responsibility of coordination. Liz Snoddy and Robert Huggins are students in the program, so they're in the position to talk about implications for the cohort group. Project Teach is a teacher education program for non-certified, non-licensed employees of public schools. There are twenty-three students in the program who work full-time in a variety of occupations: classroom aides, school secretaries, school accountants, office personnel. The program is organized so that they have the opportunity to continue to work full-time, because they are students who have outside obligations and need to work. We organize the teacher education program, particularly the professional education components of that, as a cohort group activity in the evenings following a full day of work. Because of the evidence we've had of the advantages of the cohort group projects and what we perceive to be the obvious needs of these students in view of the roles and responsibilities that impact their lives, we believed that providing or building into the Project Teach a cohort group concept might satisfy some of the group's needs. So as two participants in Project Teach, Liz and Robert can share their notions of the extent to which the cohort group part of the project is working.

Elizabeth Snoddy
Student, Teacher Education, IUPUI

ES: We're a group of twenty-three people. We started out with twenty-five, and we have lost two. This summer, taking classes individually, we realized how much we missed each other, because we support each other in attitude and emotions; we share everything. In fact, sometimes I think that we overwhelm our professors, and get them off track. We have developed many friendships and are so supportive. If someone has been out for a week, ten people are going to call that person to find out what's wrong. If someone is having trouble with a test, somebody else will furnish him or her with notes. We'll tutor each other if necessary.

Robert Huggins
Student, Teacher Education, IUPUI

RH: The group started with the premise that all of us desired to become teachers. All of us have jobs that are education-minded; mine has always been in business. I manage the finance office in the school in which I work. We now are in a college setting--most of us have had some college--and once we complete the program, we will all have the opportunity to be in the classroom as teachers.

We have all come to like each other. Prior to this, we didn't know anything about any other group member, but we all have one goal, to become teachers. Initially, we will all be teachers. Some of us have aspirations to go into the administrative areas, some want to remain in teaching. That group is broken down into elementary, high school, and some have thought about becoming college professors. We work very well together in sharing information. Arrangements have been made to hold classes off-site, and this has helped us stay together. And when we broke off into our various groups during the summer, where we took classes by ourselves, we missed each other. The enthusiasm of going to the class was not there. The adjustment that we had to make to a particular class was harder, because we were doing it without the rapport of those whom we had come to know. So the learning process is enhanced by helping each other. We exchange notes, we help each other just by being there.

ES: We are also uninhibited now. In one class we discussed bussing. Half of the class had never experienced it because we were too old, so we couldn't relate, and the other half was able to talk and explain. We say what we think, and we get into some heated discussions because we're so close.

RH: We encourage attendance and participation. When someone is absent, it generates concern, especially if there is more than one absence. We think that someone may be at the point of dropping out, maybe the pressures of work and taking classes are taking a toll. We take all these factors into consideration and look out for each other.

ES: We also have support within IPS. All the teachers are aware, and they're all supportive and eager to have you in the classroom. And we can select where we go and which teacher we observe, and that helps.

RH: Observation has been an important part of the program. Because even though we all work for IPS, not all of us are in a classroom. For those us who are not, it's a very good experience to go in and actually see what is down the road for us. For those of us in

secondary schools or who desire to be in secondary schools, observing a first or second grade classroom is totally enlightening. The people who dropped out did so for other reasons than disliking what they observed, there had pressing obligations. But observing has given us more of an interest in teaching. The desire to teach is paramount in all of our minds, and the road we have taken to reach that goal is working out very well. The cohesiveness of the group has turned out to be a tremendous bonus, helping each one of us.

ER: In addition to the opportunity to help each other and meet in their classes, the group meets on a monthly basis at an additional time for cohort group purposes. We began this in the spring semester. The cohort group at that time was building community, talking about what it meant to be a cohort group member, developing the close relationships that we described. The group has since taken on additional educational responsibilities. Each of the cohort group meetings now includes an experience which is an extension of the teacher preparation program, and the responsibility for organizing those experiences is assumed by the cohort group members, either individually or in teams. Last month, there were two people who came in from the prosecutor's office. They talked about child abuse and the implications for teachers in identifying and reporting suspected cases of child abuse. That is an example of some of the things they plan for the cohort group meetings.

ES: There was a presentation on "Teaching the Black Child" at Butler University, and we attended this as a group.

RH: Most schools are multi-cultural, and it's helped us to see the mix in the classroom and how it's working in the classroom and with the faculty, the teacher attitudes; to envision how we will work as teachers within a multi-cultural class, or with my identity as a black person in a classroom. These are aspects which are proving to be very valuable to us, because so many of us have not looked at them up to this point. There are a wide range of ages in the program, male and female, black and white. The mix is there, but we're all helping each other. We pick each other's brains as we go along. We're all learning the same subject matter, but we're learning from each other's experiences so that when we put all this together and get in front of a classroom, we'll be able to reach back and draw on what we have learned.

ES: I think if you could see the attendance roster, you would see that we are all eager to go to school. Some classes are better than others, but as a group we look forward to seeing and talking with each other twice a week.

WL: Are there any questions?

*: This is a question for all of you, but maybe particularly Ed, Robert, and Liz. What kind of difference will the program make as far as the kind of teachers that you will be? Comparing this program with a traditional program, for example.

RH: I would say two things. One would be the fact that as a group, we're learning from each other, we're putting all this together in a completely different way than a group of students who are graduating with a degree to go out and teach, not having been together as a unit. That is helping us very much. Also, we have the desire, the opportunity to do something that we've wanted to do for so long.

ES: We're learning about problems that teachers face everyday in the classroom: the aides having trouble, or the student. These are things that you might not learn about traditionally. People just aren't as verbal. Some people may encounter problems in one school that I may never encounter, but now I know what to look for.

ER: This would be a better teacher education program even if it didn't have a cohort group component, because the participants are engaged every day in the schools. Even those who are employed in the office can't avoid interacting with issues occurring in the schools. But I think that Liz's point, that they are coming together as a group and widening their experiences, sharing in the experiences of twenty-two colleagues who are also in schools everyday, is important. They bring to their teacher preparation program a perspective about teaching that you couldn't get any other way. As a result, they have to be better prepared to function in the classroom.

ES: I'd like to add an example of that. I work in the central office. I never see a student, ever. So the people in the schools think that we don't do anything. One of the issues we're facing is textbook adoption, and these people in the classroom are saying "Pick what you want," and "It's really not an elimination process," and because we're in the central office we're able to say "Yes, it is," and prove it. Or I'm listening to someone talking about the trouble they're having with a special ed. child, a discipline problem that I won't see in observation, because children aren't on their normal behavior when you're observing.

*: So this is like extended student teaching.

RH: In a traditional program you wouldn't do this much observation until the semester before student teaching. We're doing this early on, we're going into classrooms and seeing this, and observing this, and we're having people come in and talk to us from the field about the things that we may encounter. So we're gaining, hopefully, as much as exposure that we can before we're in front of the classroom.

ES: We're also forming professional relationships in advance, and that goes a long way to keep you from feeling that sense of isolation as the only adult.

*: Is there some system to help you become aware of how you're participating in the group, a mechanism for measuring what the group is doing for you individually? Or asking you to theorize about what sort of teacher you will be because of this?

RH: Each teacher that we have had so far has made a point of asking us that, asking us as a group, how do we feel about teaching, from the beginning until now, how our viewpoints have grown and changed regarding the classroom. In some cases it has been a written analysis. The teacher we have now asked us to write down our viewpoints on the first day of class, and she's going to analyze them and write out a summary for the class.

ER: Project Teach has an evaluator who has a responsibility to assess the things you have mentioned. He meets occasionally with the cohort group, he takes notes, and he interacts with the group to find out the progress. We expect to get some insights about whether we can document the testimony.

*: Documentation outside of the group is one thing, but I was wondering about documentation within the group.

RH: A journal is something that has been pointed out to us as something of importance for our self-evaluation. One class last semester required that we keep a journal to record our responses to classes, meetings, and experiences, and that is something that will help us look back on the program as a whole.

*: I like the idea of the community support. Have you considered letting students in, like letting elementary students choose a textbook?

ES: We have nothing to do with textbook selection, that was just an example of administrative duties.

*: That has something more to do with corporate level and publisher and availability.

*: I just wondered about the possibility of getting input from the students.

ES: We as students could be on a textbook selection committee, but as far as the school students, their parents could be on the committees.

ER: The cohort group hasn't been involved in selection, that was only an example. But they could come to feel strongly enough about policies in the schools that they might decide to become an advocate for changes in those policies. And they certainly are advocates now for policies that we have at the university.

*: I want to make a comment about observation in classrooms. I notice a lot of times when people come into a classroom, they notice the things that are good. How much do you notice of things that are bad and things that you'd like to change? When many students are making the comment that they don't understand, would you be willing to change things?

ES: One of the courses that we're taking now is a general methods course, and we're learning how to do lesson plans, how to be objective so that when we go into a classroom we can see if a teacher is prepared, if she has control, and if she is making a mistake. In a testing situation, if question four is missed by most students, than obviously you didn't teach that correctly or you would have a better response. So we're learning what to look for.

RH: One comment earlier concerned the teacher process, and whether we as teachers were broadcasting information. At the other end of the spectrum it's an exchange. This is one of the things that we're picking up on--we will be as effective as what we bring to it. And we as a group are putting all of this together so that when we do enter a classroom, we will have more to bring to it, from the various textbooks, and it will be an ongoing process, we will continue to learn in the classroom as well as teach.

*: It could be helpful for you to observe weaker teachers so that you don't make the same mistakes, but in relation, the person you are observing is like a mentor. But it could be helpful for then to have feedback from you, to help them.

RH: In some instance this is being done in conversations, but thus far, I don't think that any of us have been put in a position to critique the class. We are there to observe, the things that we think are wrong--we generally ask why did you do this, rather than that.

ES: We're not in a position to alienate ourselves. If we're not good, we won't be allowed back in.

*: What is the format of the cohort group sessions?

ES: We usually begin by sharing some classroom experiences and then we bring up the issues that we have. The last time our discussion was very heated. We talked about what we expect from IUPUI and what they expect from us, particular courses, and misunderstandings.

RH: This is a pilot group. Ed is one of the organizers and he has been very instrumental and has tried to bring back as much information to us as IUPUI offers. The person Ed works with is a representative of IPS. The two of them together act as our leaders and monitor us. They bring the things to us that IUPUI and IPS are offering, and we bring to them the good and the bad, how we see things are working, and if what we were told is not how it is or should be. It's an ongoing process.

*: Is it a sequence of topics that are discussed or is it a free discussion?

ER: We tend to have an agenda. Initially it was more open and we tried to include announcements, then some discussion and interactions. At the beginning of the semester the group concluded that there should be a more formal way to collect information and views and opinions, particularly related to making modifications or changes in the program. So they elected a member of the group to be the liaison with Jim and I. Liz Snoddy is that person. At the last meeting Liz brought an agenda that she had developed, clearly from the interactions of the students when they meet twice a week for their regular classes, and it had to do with an issue in one of their classes. It also included issues about transcripts, and looking at what sort of things were needed to plan next semester's sequence of courses. We asked for volunteers in the cohort group to take responsibility for the second part of the meeting. We asked them to make their own decisions about what kinds of resources they might bring to the meeting. What happened last time was that the person in charge heard about the program at Butler University and simply arranged for the group to go to Butler and participate in that session.

WL: I want to give the members of the panel a chance to make comments to each other or to clarify.

HG: I want to make the comment that once you get into the classroom that you bring this level of collaboration to your students. You bring collaboration into your classroom, and I think it's very exciting.

HH: One of the things that just leaps out from our interactions with our respondents, from the data that we collected, is the fundamental necessity of forming a support group. What we hear is "I survive or don't survive as a professional depending upon the quality of support I receive, not only from my family but from my profession, from students, and from peers I went to school with." It's absolutely essential to have support. You guys are fortunate because it's rare.

ER: That was part of our program because it was built in. My impression is that you organized yours on your own. Do you have a view whether one is preferable to the other?

Is a support system more effective if it has developed spontaneously, in comparison to our program which we didn't leave it to chance?

HH: It's just a function of the personalities involved. If you're a pain in the rear and you try to force a support group, then chances are that it's not going to work too well. But if your listening skills are good, and your heart and soul is engaged in what you're doing, then it will evolve. You can't really coerce it. We were supported passively to go ahead and wing it, which we did, but we didn't go without support.

HG: This sprang to some extent from a course we were taking, and all of us, with the exception of Dulcie, knew each other previously. We had been going through this together for some time. It's really hard to exist in the English department. We have no community--there is no one to support you, prompt you, just listen. Being in the English department without that is so difficult--I feel isolated. There are professors who are nice, you make an appointment and they'll talk to you, but they're busy and it's just not the same rapport. On the other hand the attitude that I've seen--it sounds like I'm glorifying the department of education--but the kind of attitude I've seen there is a lot more professional. They admit that you have something to say as a graduate student, that you have credence. And that kind of attitude is really welcome; it really reinforces my sense of my identity as an educator.

ES: One of the things I value from our group, is the span in age--there is twenty years difference in age. Some of these people I would never have associated with under normal circumstances; I'm old enough to be some of their mothers. I was relating to your group because when I was taking a group this summer, the younger people tended to clique together and the other older woman and I were left out. With our cohort group, everyone is included.

MJ: When it comes to whether the cohort groups should come from the top or the bottom, when they come from the top, especially when it's a minority group, it's important not to label it remedial, as in "We're here to help you because we know you can't catch on." Students won't come, because it insults their intelligence. Extend the help, build the support groups but let the kids have their pride.

*: On a final note, I feel very strongly about collaborative learning. It's important to bring that into the classroom. I'm always griping that I don't have that as an educator. I do it in my classroom but I'm alone outside. Your program should help you overcome that.

ES: It will be a lot easier for Robert to come to my classroom and criticize me than it would be for you to come and criticize me.

*: I think that I need to point out that what we were talking about in support groups during lunch doesn't mean that we delight in each other's entire beings all the time. There are certain things that people do that irritate me on occasion. But that's beside the point. We have accepted that there will be times and things that will irritate us, and it really has not been a problem in our group.

RH: Being from a business background, I compare this to setting up committees. Anytime you want to get something done, you establish committees and you thereby become a group of antagonizers. But our purpose is to become educators, and with that we have to become listeners and receivers. And we're not establishing a committee, we're a group

with a common goal who is working together. Though we speak out, we give and receive and to me it it working beautifully.

WL: I really feel that this past hour and a quarter have been a good example of the social construction of knowledge, and I hope that the dialogue and conversation goes on.

THE SOCIAL CONTEXT OF NETWORKED LEARNING: COMPUTERS AS MEDIUM

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Recent educational theory and research argue for a notion of knowledge that is not absolute but rather socially constructed. Computers bring new opportunities to exploit the social nature of learning as well as new challenges for implementing these initiatives. Four computer projects illustrate the advantages of computer supporting the social dimension of learning and the challenges such innovations offer the university system.

Stand-alone applications, where a class uses a computer program during class time, have been used in a class where the software aids the student in analyzing a work of literature. The analysis is then posted on a bulletin board so that students can read and discuss each other's work. Networked classrooms allow the students to get responses to their writing from their peers. Electronic mail (BITNET) enables students to correspond with students on other campuses, even in other countries, and thereby causes them to confront the needs of the audience in their writing. A campus-wide application of computer conferencing creates a learning community, extending learning beyond the classroom.

Problems with high costs, lack of technological expertise, and misunderstandings about needs and budgets make the implementation of computers in education a challenging project, but it is a challenge worthy of consideration by the educator.

A person is learning: she sits alone at her computer, surrounded by books, a printer, even paper and pencil. But though she is alone, there are three important social and societal dimensions to her acts of cognition. First, recent educational theory and research argue for a notion of knowledge that is not absolute but rather socially constructed: the books on our student's desk contain more than data, and an original contribution to scholarship must be embedded in an on-going conversation within knowledgeable networks or "discourse communities" (Bruffee). In the history of science, Thomas Kuhn argues, for example, that paradigm shifts occur within a field when a new hypothesis challenges a widely-held theory, and subsequent debate leads to acceptance of the new paradigm. It is acceptance by the specialists or discourse community that warrants the idea's elevation to paradigm. In this sense of ideas as "local [and revisable] knowledge" (Geertz), we can argue for the social construction of knowledge.

Second, a social view of learning reconceptualizes the process of learning as well as the knowledge-base of study: the student we have imagined is not alone, for she carries with her the responses (actual or anticipated) of teachers and peers. The influential theories of the Russian psychologist Lev Vygotsky suggest that people learn to think independently on the basis of their experience with face-to-face conversation, a form of communication that

develops an awareness of audience needs and responses. Learning environments that make use of collaborative learning can strengthen individual cognition by involving students more actively in their own learning (DiPardo and Freedman).

Third, Marxist critics of education stress that surrounding the individual learner is an educational system (manifested for example in class size, tuition, kind and access to facilities) that is profoundly influenced by societal and political philosophy and decisions (Ohmann).

Because computers represent an educational innovation that causes re-examination of accepted procedures, studying such implementation can give us new insights into our educational institutions: who gets resources and for what purposes, who controls those resources, and how are such decisions made? However, computers also bring new opportunities to exploit the social nature of learning as well as new challenges for implementing these initiatives. This paper illustrates these contentions with four educational computer applications designed to enhance the social aspects of learning and requiring different levels of cooperation by faculty, computing professionals and academic administrators at Indiana University-Purdue University at Indianapolis (IUPUI).

Planning for the infrastructure

Four computer projects with which we have been involved illustrate the advantages of computers supporting the social dimension of learning and the challenges such innovations offer the university system. All four grew from faculty initiatives, yet their level of success and ease of implementation depended on establishment of an infrastructure for such activities, guided by a clear and strong emphasis on computers as part of the institutional mission and long-range planning and allocation of resources by Computing Services.

The IUPUI development plan highlights the campus' central position as part of two state universities, delivering professional and undergraduate education in the government and business capital of the state. The plan envisions IUPUI "as a nerve center for the broad use and adaptation of electronic technology" to distribute and use information. In preparing the citizens and work force of the next century, the campus should lead in the exploitation, use, and application of the new technologies. Goals to achieve this end include providing widespread, far-reaching access to sophisticated computer and media resources:

--permanent accounts to over 26,000 students as long as they are enrolled
--a network-connected personal computer for every faculty and staff member
--state-wide, national and international access for students and faculty who are sometimes restricted in time and place and other times neither time nor place bound (for example on business trips or conferences)

As a result, the campus has a variety of computer resources available:

--open clusters available to students for doing homework assignments on a stand alone micro or on the mainframe computer; some of these can be reserved for class use
--classroom labs used and supervised primarily by one department or school (Education, Journalism, English)
--several mainframe computers for research, teaching and administration, including electronic mail facilities sufficient to provide student accounts
--faculty access to computers in offices and classrooms with advanced learning technologies available

Computing Services is committed to serving faculty needs, but seeks ways to meet beginners' needs efficiently enough to allow time for helping faculty "stretch" their vision of computer use as new, more powerful hardware and software become available. The goal is not to promote computers per se, but educational use of their power. The question Computing Services wants to ask is, "What do you want to do?"--not "Would you like this piece of equipment?" Faculty development grants and distributed support keep faculty and curriculum the focus of computer use. And the willingness to distribute control and share responsibility keep technology integrated in learning, rather than centralized under the exclusive ministrations of the computing center.

This institutional setting can support a variety of computer applications based on belief in the social construction of knowledge and socially-embedded process. Networking in education provides an audience to listen and to give feedback. Although instructors have always provided an audience, they are often perceived by students as judges who check the "knowledge telling" of students. By contrast, a listener is not a judge checking correctness, but an audience who must come to understand the student's ideas. Feedback becomes a way to improve the process of communication, without the element of judgment often implicit in teachers' comments. Thus peer networks help in the process of learning, providing the audience crucial in Vygotsky's notion of learning. Networks can also provide a discourse community in which ideas are discussed to add to knowledge of the field. Such opportunities provide authentic situations for learning often missing in education, regardless of the discipline involved in the application.

Stand alone applications

The simplest of the four applications to administer, from a faculty point of view, involves having a class use a computer program during class time. The faculty member is m charge of the classroom and only needs to reserve the room and arrange purchase of the software. In our first example the software SEEN, winner of an EDUCOM,NCRITAL award as Distinguished Software, allows students to choose from a variety of tutorials that help them analyze a work of literature (or art or a historical event) and then to post work on a Bulletin Board programmed into the software so that students can read and discuss each other's work. In the tutorial, open-ended questions elicit student response with generic questions made specific to the student's topic by embedded strings provided by the student. The program does not judge answers: feedback is provided as students assess their own work or respond on the accompanying bulletin board to the ideas of other students.

Studies suggest that SEEN's Bulletin Board may provide a discourse community with real impact on the sophistication and revision of ideas in resulting papers. Schwartz described how students internalized the questions of the literary discourse community with repeated use of a tutorial (Schwartz, in Wresch). Hastings traced how students used peer comments from SEEN (used as an out-of-class requirement at the University of Wisconsin at Madison) in writing an essay assignment. Schwartz and Fitzpatrick at IUPUI compared responses to questions when students wrote with paper and pencil and with the computer program and found that most students answered fewer tutorial questions but with higher total words and greater development with SEEN, and their comments tended to be longer and more focused on task than with paper and pencil.

Networked classrooms

The use of local area networks (LANs) during class time requires greater planning and cooperation. About half of the writing classes offered by the English department (83 sections per semester) now meet once a week (half their class time) in one of the computer-

equipped classrooms. Twenty-one computers are networked on a local area network (LAN) using software (Daedalus Group Software, Austin, TX on a Novell network) that allows real-time chat with the class as a whole or in simultaneous sub-groups. In contrast to face-to-face peer review, students have a written record of the responses to each other's work. The transcript allows individuals to get suggestions in writing, and it allows the teacher to work with the group on making their responses more effective.

The program, started in 1987 under a grant linking IUPUI with the Indianapolis Public Schools (Cambridge and Connor), has succeeded and grown because of cooperation and distributed power to support faculty. As with similar classrooms for Education and Journalism, the equipment comes from Computing Services, but the rooms are scheduled and supervised by a computer coordinator from the academic program that uses the classroom most. All writing classes have a student consultant at all times, in part because most faculty who teach the courses work part-time and have, until recently, had very little access to the computers outside of class. Working with the Writing Program's Computer Coordinator are two technical advisors who serve all departments in the School of Liberal Arts.

Problems arise because local needs may conflict with university-wide goals: what is best for a particular class may not be best for computer competency on the campus as awhole. Because writing is central to students' ability to learn and communicate, composition courses are required of all undergraduates, and about half the writing classes (1800 students per semester) meet regularly in networked computer labs. Because so many students' first introduction to computers is through these writing classes early in their university career, it would be useful if students learned to use a full-functioned word processor that was supported in all clusters. However, writing teachers don't want to take time from instruction to teach word processing or computer literacy, and so the Writing Program adopted an exceptionally simple but minimal word processor. From the viewpoint of the university's computing center, which lacks the resources to support an unlimited number of word processing packages, the Writing Program's choice of a simple word processor represents a loss of opportunity; tradeoffs need to be negotiated (Schwartz et al.) with meetings to listen to each others concerns, and control shared or distributed. At present, the Writing Program is testing a more powerful word processing program with upper-division courses and is cooperating with other departments in testing an integrated package (Microsoft WORKS) for possible adoption in several courses with large enrollments. And the computing center has started to offer short courses, free to students, on how to use word processing packages.

An alternative vision is provided by Charles Moran, a Professor of English and director of a writing program, in an article published to advise other writing teachers using computers. Moran wrote the specifications for a networked computer lab himself because he wanted to retain pedagogical control, and he had to write them quickly because funding would disappear after two months. He rejected the advice of the Computer Center:

> they were . . . engaged in turf-wars, the struggle for survival. They advised us to install a complex network that we could not manage ourselves. But no matter. They would manage it for us, by remote control, from the Computer Center, located about 3/4 of a mile north of our building. . . . [And] the writing classrooms would have to become public classrooms to which we, the Writing Program, would have access. Unless the facility was public (read <u>theirs</u>), the Computer Center could not help us with maintenance and supervision. (65-66)

The paranoia and lack of shared authority are palpable.

Telecommunications for one class

A third application used electronic mail (BITNET) so that American students in an introductory class at IUPUI could share their responses to American and Finnish plays with masters-level literature students at the University of Tampere in Finland. Electronic mail made possible the planning, coordination and exchange between the two classes and the two instructors--Professor Aarre Heino and Professor Helen Schwartz--who were not to meet face-to-face until three months into the semester. Cross-cultural study of Miller's Death of a Salesman and Manner's Snow in May put into practice a number of theoretical assumptions about collaborative learning:

> --that having a real audience and authentic purpose helps students understand and meet audience needs better than in the situation of students writing solely to the teacher as expert.
>
> --that international collaboration would show to what extent literary meaning is universal and to what extent "local" (that is, based in individual and cultural experience).

Although both American and Finnish students enjoyed the exchange, they and the professors felt that future collaboration should allow students to write to each other directly, rather than having the professors forward the texts (Schwartz, "Cross-Cultural"). This revised format can be accomplished in the next such team-taught course, since IUPUI students can now sign up for permanent accounts (not class specific) and take short courses to introduce them to the technology.

Making student accounts available, like coordinating the choice of word processing programs, is important to implement the vision of computers as an integral part of a total learning environment. In the past, computing centers have operated to serve faculty on a class-by-class basis, but the notion of a learning environment advanced through technology requires that students have computing available throughout their college career, with training time spent on acquiring ever more sophisticated skills. All students should be able to profit from on-line access to the card catalog, not only for IUPUI but for all the campuses in the Indiana University system, not only in the library itself, but at their workstations in computer clusters or from off campus. Planning for this kind of total environment creates capabilities that serve classes like the literature class using Bitnet, but it also calls for integration of computing across the curriculum.

Telecommunications campus-wide

Our fourth example, the Twenty-First Century Scholars Project, illustrates a campus-wide initiative, designed to transform education for the urban commuter student, building a learning community with computer conferencing to extend learning beyond the classroom and to integrate education with the many roles and responsibilities of our diverse student body.

Our initial experience correlated with similar projects, suggesting that computer conferencing supports the building of community (Schriner and Rice), but that results depend importantly on the teacher's ability to create a learning community (Hiltz). Our beginning project gave evidence of meeting our goals while also showing us the kinds of logistical, pedagogical and motivational problems that caused us to form Team2l, a group of faculty, students, computer professionals, academic administrators and advisers from IBM, cooperating to find answers and solutions. Students in three classes participated: the

Planning Group of students (working with Dr. Herman Blake, Vice Chancellor of Undergraduate Education, and continuing from last semester's course on American Ethnic Minorities team-taught with Professor Helen Schwartz), another section of American Ethnic Minorities (5200) team-taught by Dr. Blake and Professor Susan Shepherd; and Computers and Writing (WS 10), a graduate class taught by Professor Helen Schwartz.

Faculty and students built a supportive, holistic environment for exchange, with notes answered quickly, whether the respondents were students at home with sick children, teachers at conferences or teacher-administrator presenting student work via the bulletin board at national meetings. Students soon learned to provide supportive response, at first about ideas, but also including experiences outside the classroom that became part of the inquiry into learning--for example, exploring ethnic roots in Appalachia or the birth of a student's first child. Faculty gained a better sense of the students' learning environment, as well as supporting each other during exchange of teaching logs about the classes.

Students took a more active role in the class, the university and the community. On the Bulletin Boards, students in 5200 began to initiate inquiry, asking that certain topics be covered in class. In the Planning Group, students attended high-level administrative meetings and reported to the Group on their confidential BBoard, discussing in class how decisions relate to ideas about liberal education and policy at IUPUI. In W510, students report on projects involving minority students, developing computer literacy at the Christamore House Community Center and supporting writing for I-Have-a-Dream students from Attucks Middle School. And the bulletin board provided new structures for bringing expert resources into our classes. Experts from other schools (Purdue, Stanford, Minnesota, University of Edinburgh) contributed to our Bulletin Board, and class members participated in a teacher-training institute held in Edinburgh by being respondents to the English teachers there learning about electronic mail.

Because the project has the potential to affect all students and to implement long-range institutional goals for computer use, the Twenty-First Century Scholars project commands allocation of resources beyond its current size. For the Computing Center, the challenge is to find a way to facilitate such efforts in the long term without specific assigument of staff--that is, to provide service potentially for all students (26,000 in 1990) as a routine, standard function of the Computing Center. For the faculty, the primary challenge is to develop and test effective pedagogy for diverse teaching styles and levels of students. For the university, with a vision of technology centrally involved in its research and teaching mission, the challenge is to document institutional and societal barriers to computer access and to work with our community to find ways of providing intensive and equitable access to all students.

The barriers to computer use in education are many. Most important is the need to ground innovation theoretically, rather than using computers as a solution in search of a problem. Costs are high; technological expertise is a scarce resource; equipment and software are always in danger of becoming obsolete because of constant advances in the field. Jealousies over budgets and status can breed distrust. Different vocabularies undermine communication. However, the value of computers to support the social nature of learning challenges us to build organizational networks and partnerships to achieve the institutional mission supportive of educational computer use.

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HYPERTEXT AS A MEDIUM FOR STUDENT COLLABORATION

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Hypertext--nonlinear, computer-based writing--is being used more and more in business and government to create new kinds of easily navigable databases for managerial decision making. Because of its nonlinearity, hypertext also provides an ideal medium for student collaboration.

Students in an undergraduate business writing course at IUPUI are working in groups to write hypertext reports on Fortune 500 companies, using a program for IBM-compatible microcomputers.

Hypertext

Hypertext, named in the 196Os by Ted Nelson, has been variously defined as "nonlinear" or "multidimensional" writing, but a more detailed definition might be "writing designed to be read--and perhaps added to--along many different paths, at the reader's choice."

Among printed materials, the first book approaching hypertext status was perhaps the Talmud, with its layers of law, commentary, and commentary on commentary, all linked together. Most reference books have hypertextual qualities: the Variorum Shakespeare, for example, with its elaborate footnote links, can be thought of as a kind of hypertext, as can the Britannica 3, with its extensive cross-referencing and its multiple means of access. The most hypertextual of novels is surely Finnegans Wake.

"Programmed" textbooks are another form of printed hypertext: students choose answers to multiple-choice questions and are directed--linked--to different pages depending on their choice. Similarly structured are the popular children's books (and a few for adults as well) in which readers, playing the role of the main character, make choices that lead or link them into different story lines.

What the computer does for hypertext is increase greatly the speed and potential number of the links. But the difference between printed and computerized hypertext is more than quantitative. A good computer-based hypertext is a qualitatively different communications medium; it gives its reader the feel of moving effortlessly through a transparent information environment, like a fish in a sea of knowledge.

While versions of hypertext have existed on mainframe computers for two decades, only in the last two years have hypertext systems become available for microcomputers. Best known is Apple's HyperCard, packaged with Macintosh computers, but a number of hypertext programs exist for IBM-compatible machines as well; one of the newest is IBM's own LinkWay.

In education, business, and government, hypertext applications are flourishing. The United States Environmental Protection Agency, for example, is using the hypertext program Guide for its "Reg-in-a-Box" hypertext on underground gasoline storage, and

Ford is in the process of installing a Guide-based hypertext system in its automotive service departments.

Student-written hypertexts

In the undergraduate course English W331, Business and Administrative Writing, at Indiana University-Purdue University at Indianapolis, students conclude the semester by working in teams of three or four to produce a major report. This report details events for the past year that might affect the value of stock in a selected "Fortune 500" corporation and makes a recommendations about buying or selling that stock.

Currently, students in the course are given the choice of producing this report in hypertext form instead of linear, paper form. So far, all teams have chosen hypertext as their preferred medium. They write the report in screen-sized "nodes," using the same simple word-processing program they have used for their conventional writing during the earlier weeks of the semester. But as students write these nodes, they also include coded links to other nodes, as well as additional "menu" nodes that give the hypertext its overall structure.

The resulting hypertexts are read using HyperRez or HyPlus, free programs developed by Neil Larson of MaxThink. These simple programs display a graphics or ASCII text file; the user then presses the up and down arrow keys to select one of the coded links on the screen, the right arrow key to jump to the new file named in the selected link, or the left arrow key to return to the previous file.

As students gather information for the report, they get the same research practice they would have in preparing a more conventional document. Within each node, they are, of course, writing ordinary linear text, so they must use the same writing skills they have been refining throughout the course. But as they assemble these nodes into the hypertext, the students face new challenges not posed by ordinary text: they must consider many more possible relationships among pieces of information, and they must consider many more possible reader paths through that information.

But the students seem to enjoy those challenges. In part, this enjoyment comes from the collaboration and from the excitement of working in a new medium. But in part, it comes from the students' sense that they are preparing themselves for a future in which hypertext will surely be an important medium for business communication.

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SUPPORTING LEARNING WITH PROCESS TOOLS: THEORY AND DESIGN ISSUES[1]

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Existing learning environments need to be reconsidered if they are to function in support of the constructivist model of learning. Too many models focus on the content database with hypermedia as the primary component of the learning environment. Yet these databases seemingly encourage the learner to be a passive receiver of information. Recognizing the cognitive and social processes that are an inherent part of learning, new efforts needs to focus on building process tools designed to support these processes.

Models for this type of development can be found in the areas of group decision support systems and computer supported cooperative work. These models must be adapted to suit educational purposes, however, because they are intended to help people in business and research situations accomplish tasks, whereas the focus in the fields of education and instructional technology is to help people *learn how* to accomplish tasks.

A networked electronic environment referred to as Roundtable was rapid-prototyped in an attempt to support the following processes in a social environment: comprehension, idea generation, analysis, composition, reflection, and communication. This was tested in a class in the Indiana University School of Education called "Critical Reading in the Content Areas." Through this experience it became apparent that collaboration is not a strategy, but a fundamental component of both learning and work.

Introduction

We have been working to develop our understanding, in terms of instructional design and development, of the implications of a constructivist epistemology (Brown,1989). From this perspective, learning is seen as a *constructive* rather than *accumulating* process. That is, people actively construct knowledge and understanding through their individual and social experience in, and interaction with, the world (Streibel, 1986). According to Resnick (1985, p. 2570), "These constructions respond to information and stimuli in the environment, but they do not copy or mirror them." Every concept that we learn derives its meaning through its relationship to the context in which it is intimately embedded and from the tasks in which it is used. Brown and his colleagues have referred to this notion as situated cognition (Brown, Collins, & Duguid, 1989).

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[1]This paper also appears in the *Proceedings of Selected Research Presentations at the AECT Conference*, February 1991, Orlando, FL.

historically been supported through a strategy of human contact and more recently through computer technologies.

The tension between content and process

We have seen, however, a lopsided investment of technological energy and instructional focus into one of these components: the content database. The major area of effort has been in the delivery of a specific core and contextual database along with practice strategies aimed at student retention and understanding of the database. Computers and other teaching machines have seemed to offer an efficient and consistent method to deliver sequenced material with a navigation strategy of branching and co-requisite learning activities such as tutorials, simulation, and drill and practice. Most recently, hypertext and hypermedia seem to offer the designer's dream in putting at the learner's disposal unheard of amounts of potential source material along with a navigational strategy of browsing and, when that fails, guided tours.

The focus on the content database has occurred, we believe, because of a belief about the nature of learning which is often contrasted with constructivism. Instructional designers have traditionally focused on creating learning environments intended to transmit a set of information to the learner, for example through appropriate displays and sequences (Merrill, 1983) which promote *individual* learning. New technologies, for example hypermedia environments, have, by and large, been based on this same view of learning. Hypermedia is thought to provide learners with the ability to *browse* through information spaces, acquiring information and knowledge as a result of their journey (Byers, 1987). The learner's goal is to *find the particular information* that he or she is to know. The design of hypermedia systems has centered on the creation of large navigable databases.

Unless special tools are made available to help the learner actively construct knowledge, hypermedia databases might actually encourage the learner to be a passive receiver of information. Passive browsing of an information space (i.e., text) results in superficial learning (Brown, 1981). Additionally, typical hypermedia systems provide little or no feedback (Hammond, 1989)--a critical component to the traditional approach to instruction. In contrast, good readers are active readers who utilize a variety of strategies or processes for managing their understanding of the material (Garner,1987). For example, they take notes, highlight important passages, make outlines, mark text to be reread, paraphrase summaries, and so on. Processes shown to promote even higher levels of understanding include designing a presentation, writing a synthesis paper, keeping a journal, and using a critical analysis strategy to analyze the material. An important relationship exists between the artifacts created from doing authentic tasks in authentic contexts and the learner's constructed knowledge.

The development of learning environments based on the individual learning and information transmitting paradigm also does little justice to take advantage of the social nature of learning. We have come to value the notion that not only is learning a constructive process but also that meaning is negotiated through collaboration with others. Each of the processes listed in the preceding paragraphs is enhanced through collaboration. In Vygotsky's view (1978), an individual is limited in the problems that can be solved and the tasks that can be completed on one's own. Help from others can provide a way for going beyond one's current level of competence and working on problems in one's *zone of proximal development* (ZPD). An expert, for example, can include an individual learner's attempts in accomplishing a task and provide feedback. In this way, the individual can perceive the appropriateness of the attempts and can come to see the task as the more expert

person sees it. It is this social interaction with the expertise of others that assists the individual in actively constructing an understanding of the problem domain (Newman, 1990).

It is our assumption, therefore, that the path from novice to expert is accomplished by an active engagement with the important concepts *in concert with others*. As is commonly believed, a good way to come to understand a concept fully is to teach it to someone else. Part of this is the preparation a teacher or tutor goes through with content materials. Teachers report having learned more about both the content and the abilities of their learners through social interaction with their students (Cobb, & Steffe, 1983). Clearly, learning for both novice and expert, requires substantially more than simply 'seeing' the concepts. Unfortunately, the common technique of having individuals browse through a hypermedia database encourages the learner to stay at the novice level.

Process tools

What constructivist ideas make evident is that we have paid too little attention to the cognitive and social processes that are an equally inherent and important part of learning. We have, therefore, shifted our focus to the identification of learning processes and to building tools--that is, *process tools*--designed to support these processes. We don't dispute the value of employing database technology in the educational setting. What we object to is the lack of attention given to the development of process tools and their integration with content databases.

We anticipate that process tools will also have an advantage over traditional approaches to instruction in the area of motivation: people inherently value that which they themselves construct. Learners commonly evaluate didactic instruction based on what they received, or less tactfully, on what it did *to* them. Our contention is that this reaction is encouraged by the passive nature of the instructional presentation. Similarly, in many extant educational applications of hypermedia systems, people are encouraged to browse through information, sometimes with explicit goals, sometimes without them (Hammond, 1989). They then leave the experience with no product--perhaps a few memories, perchance some incidental learning--and often just a score on an exam. Process tools, on the other hand, are designed for use by learners to collaboratively construct a product of which they have intimate ownership.

Computer supported work

We have found interesting research and development in the area of process tools, although they are generally not referred to as such. However, this research and development is occurring in disciplines from which either educators or instructional developer's seldom draw. Designers in the areas of group decision support systems (GDSS) (e.g., DeSanctis & Gallupe, 1987) and computer supported cooperative work (CSCW) (e.g., Greif, 1988) have developed exciting electronic tools to support group processes, usually for business, research, or military operations. In fact, we have borrowed ideas from this work for our project. Borrowed ideas, however, are useful only in their ability to transfer from one domain to another. Some portions of the analogy will inevitably fall short. We have found that GDSS and CSCW analogies map very well to our domain at the level of systems design and even group interaction technology. Where it does not seem to apply in an educational domain is in its focus and purpose. The systems developed by these fields are primarily intended to help people in business and research situations accomplish tasks. In the fields of education and instructional technology the

primary focus, in light of a constructivist epistemology, is to help people *learn* how to accomplish tasks.

A subtle but important difference exists between the intended purposes of tools in work and learning settings. It is necessary for both workers and students to be involved in authentic tasks. Process tools need to make more efficient and explicit the learning and social processes so that students do not have to flounder in trial and error. Process tools for business, on the other hand, need to help workers get the job done more efficiently regardless of how much learning occurs. This is the dilemma that instructional designer's faces when trying to create or find authentic tasks: taking the tenets of situatedness to their logical conclusion would be to simply send students to work. But, since the primary purpose of work is to get the job done, businesses attempt first to employ people who *already know how*--who, in a sense, are *experts*--to accomplish the task. Learning that naturally occurs as a result of doing the task becomes secondary to getting the task done. Thus, sending students to work does not work for the business and does not work for the student; schooling needs to make the learning processes explicit, that is encourage learners to be reflexive about their learning (Cunningham, 1987), whereas business can afford less tolerance for learning at the expense of getting the job done.

In other words, the crux about what "business" is about is not learning but in accomplishing (doing) tasks as the *primary* activity. Furthermore, groups are brought together because *physical proximity* is the strategy (i.e., *technology*) that gets things done (Kraut, 1989). In contrast, education is about *learning to do* a task, about making people better thinkers. In education, *learning* is the primary activity. Constructivist theory explicitly suggests that the *strategy*, or, again the *technology*, that best accomplishes this is having learners *experience the doing of a real task*. Another central component is to have people learn *together* under the guidance of an *expert*; but not because that's the best way to succeed in accomplishing the task--it's because it's the best way for people to learn! Certainly, as Resnick (1987) suggests, these are two sides of the same coin--the coin of work.

People who are learning to do something are not efficient enough to "get the job done" in time for competitive markets. People who are working, who do not have "learning support" at their fingertips, cannot learn fast enough to do the task better until, perhaps, the next time around. And people in earlier stages of physical and/or intellectual development are not up to the demanding environments of adult work.

In our view, the most advantageous aspect of fields like GDSS and CSCW is that they are concerned with supporting people, especially groups, in accomplishing tasks. The most serious deficiencies are that they are not concerned with individual or group learning, with the stages of individual development, or with promoting reflexivity about learning as their primary mission. For this reason, although the process tools of decision support and education will be similar to a degree, they are necessarily different in some respects.

Design implications for process tools

To create situated environments, that is, environments which afford opportunities to engage in authentic tasks, we need to provide the same components provided in the work world. We have found a useful framework for understanding the dimensions of work, i.e., authentic tasks. Moran & Anderson (1990) describe the three aspects of what they call the *workaday world* which they present as a CSCW design paradigm. The three components are 1) technology (e.g., tools for communication, computation, composition,

analysis, presentation, and so on), 2) sociality (e.g., opportunities to form social relationships both formal and informal), and 3) work practice (e.g., the knowledge, skills and routines for accomplishing specific tasks). The processes of the three are not distinct, there is a dialectic between them, and they cannot be entirely separated from each other. Thus we need to deal with constructing and studying whole environments, not just the technology we inject into them. Furthermore, the technology, i.e. tools, is there to support and "enhance, sustain, facilitate, encourage, etc., people in their work as well as be a resource for creative deployment." (Moran & Anderson ,1990, p. 387).

Tools that we create or provide must support the work practices and the sociality of the environment in authentic ways. For example, tools must provide access to source information (not just textbooks--they don't provide the complexity or depth required) and artifacts. In order to facilitate their learning, learners must be involved actively by employing specific tools which support their analysis, personal construction and reconstruction (i.e. synthesis) of the information and artifacts (Scardamalia & Bereiter, 1985).

In studying hypertext systems, we initially saw three implications for design. First, the learner must have the ability to extract from (e.g., copy, highlight) and link to (e.g., bookmark) a content database. Second, the learner must have the ability to filter, re-word, and paraphrase from an existing database, in effect reconstructing their own version of the content domain. Third, the learner must be able to build a personal or community database in reaction to given information (e.g., commentary and critique) or from scratch (e.g., generating and explicating self-generated ideas) (Duffy & Knuth, 1990).

When considering the whole learning environment from the constructivist viewpoint we recognized the need to develop tools to support explicitly the construction by learners of their own representations and understandings. We must also build tools and strategies into the learning environment to provide authentic relationships between peers whereby they can readily communicate with each other and tap the relevant individual skills, experiences and perspectives of others in their workgroup. Similarly, our environments must support an authentic relationship between learners and experts. Thus learners must be supported in communicative and dialectical tasks with other learners and with experts as well as with the content and artifacts.

An instantiation of process tools

As one part of the Enhanced Learning and Information Environments (ELIE) project (a joint research and development project of Indiana University, AT&T University of Sales Excellence, and AT&T Bell Laboratories) we have rapid-prototyped (e.g., Tripp & Bichelmeyer, 1990), using HyperCard™ and Spinnaker Plus™, a networked electronic environment referred to as *RoundTable* to test our notions of process tools. In its current state of development, the *RoundTable* environment attempts to support the following processes in a social environment: comprehension, idea generation, analysis, composition, reflection, and communication.

Comprehension

To facilitate comprehension of the database we provide functions included in typical hypertext applications: note-taking, bookmarking, extraction (copying and pasting), searching, indexing, and dynamic linking. In addition, it is possible for individuals to share with others the bookmarks and links that they make.

Idea Generation

To facilitate the generation of ideas for topic-focused discussion we have developed a group brainstorming tool in which the discussion becomes part of a community database. The discussants establish new or use existing topics and sub-topics, articulate ideas and share them with the group, and react by commenting on other peoples' contributions.

Analysis

To facilitate the analysis of ideas for topic-focused discussion we have developed an analyzer tool in which the analysis becomes part of a community database. The participants establish new or use existing topics and sub-topics, articulate positions, classify positions according to a teacher-chosen logic or classification structure, share with the group, and react by commenting on other peoples' contributions.

Composition

To facilitate the construction of reports, presentations, etc., we have developed individual and group paper-writing tools where writers can create working drafts, "publish" versions to receive reactions, and then view those reactions.

Reflection

To help learners develop an awareness of their cognitive processes and development we have provided an electronic journal tool in which they are encouraged to reflect on class topics, tasks, learning strategies, group strategies, teaching strategies, and so on, as well as on the electronic environment. This journal is a private space that may be shared with the instructor.

Communication

To facilitate the self-management and coordination of group activities as well as provide the means for informal, social communication, we have provided messaging tools in which individuals can send electronic mail to other individuals including the instructor, to their work-groups, or to the entire class.

Though many of these types of tools are available commercially, we have felt it necessary to build each of them because of the need for 1) a consistent and appropriate user interface; 2) integration of information across tools; and 3) the tools to work in a unified, collaborative environment.

Case Study: Supporting argument analysis with RoundTable

Our first efforts in rapid-prototyping *RoundTable* involved supporting the process of argument analysis in a class "Critical Reading in the Content Areas" taught at Indiana University in the School of Education by Sharon Pugh (1990). An initial networked version of *RoundTable* was quickly developed that at the time included only comprehension, idea generation, and analysis tools. *RoundTable* was used by students synchronously (i.e., all students used *RoundTable* at the same time) to share their ideas from multiple perspectives. The students went to a computer cluster and were divided into small groups, consisting of three to four students in a group. The individuals each had their own computers and small-group members did not necessarily sit near one another. The task that we attempted to support was the analysis of case study materials portraying different viewpoint towards grading in a high school situation.

Students first started the Macintosh computer, copied the software from the server to their workstations, started the program, entered their name, selected their group, and entered an individual one-letter code (see *Illustration 1a*).

After reading through the case on-line (students were instructed to be familiar with the case materials before coming to class) and bookmarking critical passages in the text, the students used a brainstorming tool (see *Illustration 2a*) to exchange personal opinions on the case situation and characters. The brainstorm tool allowed students to react to the issues in the case as they identified them and potentially to project themselves into a similar situation as beginning teachers.

Second, an argument analysis tool (see *Illustration 3a*) provided a three part structure consisting of premises, conclusions, and evidence with which to classify the positions taken by the characters in the case. It was the instructor's perception that the argument analysis tool changed the nature of the discussion, allowing the students to focus more clearly on the task of constructing perspectives rather than interpreting issues, which appeared in the brainstorming function (Pugh, 1990).

The class used *RoundTable* for approximately one hour per day. The first day was taken up mostly by orienting the students to the Macintosh interface (most of the students had little or no prior experience with computers in general and none with the Macintosh) and having them explore and mark the case materials on-line. The students were quite verbal with questions concerning such issues as moving the mouse, clicking and double-clicking, and highlighting text.

. On the second and third days the students were oriented more to the task and had substantially fewer questions and problems. They were asked at the end of class to write on a sheet of paper the best and the worst experience for each day. Students' *best* comments included: "I really enjoyed being able to immediately comment on the other group members' writing", "I like the way it works that we don't have to type the commands by ourselves but we just choose instead", "For the first time computers were fun, not frustrating. It easier sometimes to communicate on computer rather than verbally", "I'm not sure yet", "I actually remembered how to do a few commands. This gives me a slight feeling of power over my computer", "I got into the system--almost--on my own. I'm starting to understand what I am doing", "It was often easier to generate my own ideas when I was able to readily see my classmates' responses. Working with this type of computer system is efficient and fun", and "I was able to take the problem into my own hands and develop and think of my own problem-solving for the situation. It makes me feel as if my opinion is the most important."

Students' *worst* comments included: "When working a computer system for the first time its always confusing and frustrating. It is so easy to get behind when following instructions", "I'm unsure if I would feel comfortable using this system without assistance", "[The worst was] the mouse, but I'm getting better", "At this point I would prefer small group discussion", "I didn't have a worst thing, my failures were yesterday", "There is not a way to comment on a comment", "I still can't do it all myself. I'm afraid when this week is over I'll be lost again.", and "There are so many little things to remember (when to single or double-click, when to hit the escape or quit to get out of something,when putting something in the trash ejects or erases)."

The comments from the students as well as from our observing them use the tools indicated to us that 1) because of their novice level we needed to, if possible, insulate them from the Macintosh file system interface; 2) we needed to greatly automate the startup and login steps involved in gaining access to the tool; 3) from the very start, training on the tools should focus on actual and not practice tasks; and 4) care must be taken in design to indicate to the user through appropriate interface cues which actions are currently appropriate and those which are not. In general, the majority of the problems that people experienced were more concerned with the physical operation of the computer rather than the use of the tools to support the group task.

Dr. Pugh had regularly taught this critical reading technique to her class prior to our development of *RoundTable*. Our hope was to use technology to augment and extend this process. We were also curious about the effect of computer-mediated discussion on the social aspect. Research in GDSS had suggested that there are distinct differences in the exchange activities of computer-mediated and face-to-face groups (DeSanctis & Gallupe, 1987).

By the fourth day, the students were able to work independently. They directed most of the problems that they did have to other students and not to us, or used the brief "cheat sheets" that we had developed during the course of the week based on student's questions. The students, at the end of four days of using the *RoundTable* synchronously, were asked to comment--using the brainstorming tool--on their general impressions of using the environment. The full text of these evaluations can be found in the appendix. Below is an excerpt from these evaluations which we feel points to the potential benefits of using computer technologies to support mediated collaboration in the accomplishment of tasks:

> [...] It has definitely made me think more critically because sometimes when talking in small groups, it is hard to get your opinion stated either because someone else may say what you wanted to say or your thoughts just get stirred up in your head and you cannot verbally say what you are thinking. It is much easier to write down my thoughts because I can type as I think. I don't have to wait my turn to talk. It is so beneficial to see everyone else's opinions on the subject. It helps to have it right their in front of you because I can always go back and refer to someone else's statement as well as my own [...]

It was not possible to utilize RoundTable for the entire course or outside of synchronous group sessions because of the limited amount of Macintosh computers available on campus and networking obstacles that proved frustrating for both students and developers. We believe *RoundTable* provided powerful conceptual tools for students to utilize actively in an electronically supported collaborative setting. However, *RoundTable* is still in an experimental stage because of the limited networking capability on campus. In our view the instructor and students should be able to access *RoundTable* from any place on campus as well as from home, providing a powerful tool for collaborative learning. We are continuing development along these lines, working with other courses and settings at Indiana University.

Conclusions and future directions

It has been suggested that effective instructional design is possible only when the developers start from a theoretical basis for learning (Bednar, et al., 1991). It was from our experience in attempting to support a specific process with technology that we have become aware of the possibilities of designing learning environments *from a constructivist epistemology*. Our experiences have emphasized for us that collaboration is not a strategy

but a fundamental component of both learning and work. We are finding that capturing and evaluating the processes that these tools support is difficult and are working to develop appropriate frameworks and metrics to inform our iterative design process as well as suggesting other classes of process tools. We are interested in a variety of data, including the emerging patterns of activity by tool users as well as the quality of their constructed products, the efficiency and effectiveness of the interface design, and the affective reactions of users towards both the tools and the processes.

We realize that we need additional experience in attempting to support other types of processes if we are to envision what a full system would entail. The attempt to support argument analysis was our first attempt of constructing a *RoundTable* environment. The interaction with the students during the four days described above, as well as additional sessions with other groups of students, has led to successive iterations of and extensions to the original tools (see *Illustrations 1b, 2b, and 3b* for representations fo the current interface), as well as the development of additional tools to support critical writing by a group. We believe that the best approach to defining the attributes of authentic environments for a range of authentic tasks is by observing students in their attempts to use tools in the completion of tasks and to change the tools based on student criticisms, requests, and needs.

What is clear to us is that starting from the basis of constructivist epistemology leads to radically different approaches to the design of learning environments and the need to glean from other fields directions for conceptualizing, designing, and making sense of processes of work and learning.

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Appendix: Student Evaluations of RoundTable

The tool has been helpful to see many perspectives on a case. I really benefitted from seeing my classmates comments. I like this tool although it was a little tough at first. It can be helpful and would be ok to use for the semester to see others comments. Once you learn the commands it becomes much easier and not really discouraging. I enjoyed this experience and am glad I had this opportunity. The tool is great. RT is better than EC!!!!!!!! [2] This was a very beneficial learning experience. I wish that we had more time to work with the program. I think that it would be great if future X401 students could use this to analyze cases.

Once I got the hang of working the system, it was really easy to generate ideas concerning the case. The system enabled me to quickly jot down my own opinions and then I was able to look at the opinions contributed by other members in my group. Additionally, when I was stuck on a particular topic, for example Frank's warrants, I could simply go to another topic and work on that one until I had come up with some ideas for the previous topic.

This program is great. It has definitely made me think more critically because sometimes when talking in small groups, it is hard to get your opinion stated either because someone else may say what you wanted to say or your thoughts just get stirred up in your head and you cannot verbally say what you are thinking. It is much easier to write down my thoughts because I can type as I think. I don't have to wait my turn to talk. It is so beneficial to see everyone else's opinions on the subject. It helps to have it right their in front of you because I can always go back and refer to someone else's statement as well as my own. All in all, this was a valuable experience. For the first time the computer was fun and I looked forward to coming each day.

I am so glad that I have been able to use this program and feel very satisfied with the fact that I have learned to use the whole program in four days. Except for the kinks, everything is wonderful. When can we use this in our classrooms? How can I make further use of this program and how do you program in your own lessons? Is this an experimental program? Round Table would be excellent to use in classrooms and allows critical thinking and commenting with out limiting it to discussion times within the classroom. Every student can comment on a topic and interact with their peers in quality time span. Great! Thanks for the help and patience. Better than EC.

I think that the RT is a good tool to use and to develop critical thinking skills. Reading people's perspectives can increase your own. I have read many perspectives that I never would have thought of. The CHEAT SHEET is a tremendous help. After spending the week in this lab, I think my skills for these MACS are increasing (still a long way to go). Comparing the RT to the EC, the RT is better because the thoughts are organized and you don't have to go through everybody's thought to get to the one you want to comment about. The RT seems better structured. It seems that with the RT, there is more to comment about. I am not sure if it because it is divided up or what!

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[2] Electronic Classroom--a menu-driven, character-based topic oriented discussion tool on the VAX computer.

I see how this type of activity can be useful if, for no other reason, it is different and, therefore, interesting. It could break the monotony of the normal classroom. I like the opportunity to be able to share ideas all at once without having to interrupt one another. The argument analyzer has been positive in that it has really encouraged dialectical thinking. We've had to take each person in the "Making the Grade" and look at the same situation from their varied perspectives. The most positive thing to me has been another opportunity to get my hands on a computer and grow to be more comfortable in using it. Thanks!

[The] cheat sheet would have been more helpful on first or second day rather than last. I like the argument analyzer, the set up helps organize your thoughts and shows your argument clearly and that of others in your group . I would have liked to see opinions of other group their perspective is different.

I think this was probably a good experience even though I don't like to use computers. I found the Round Table program interesting. I think that you underestimate the amount of work that could be done in an hour. I found myself getting bored because I was finished with what we were supposed to be doing. I also felt lost most of the time as to what was too be completed. I think the class could be more productive if we are told specifically what needs to be done or what we can work on. Sometimes I wanted to just write, like a journal entry, but I wasn't sure if I was allowed to do that, and I didn't know where to do that. I think this program would be good to use in an English that I want to teach on ethics. I think it would help students to open up and feel free to write down what they wanted without feeling that they would be criticized. I also like the idea that the students would be able to write back and forth with comments.

give me a week. I'd love to learn this system. I like the fact that it can hook up to its resources at almost any given moment, like the link hook up. I need to learn how to shuffle the cards better. And the filing is a little hard to understand at times, but I suspect that the reason is because I Am not familiar with all of the language yet.

I think the cheat sheet was very helpful.

I really liked using this system. I like the graphics. The best part about this program was that we were able to view the ideas of everyone in our group and then comment on them. Reading other reactions helped to form my own thoughts. Thanks for teaching us how to use this program. I didn't like not being able edit comments that I've entered. I also wish that I could've seen student opinions other than those in my group. There were only 3 of us, so we had a limited number of statements.

There have been times that I wanted one of my group members to read a response that I made to one of their comments. But there was no way to call their attention to it. I just had to hope that they would eventually update in that particular window. (Or I could walk over to them and call their attention to it). Overall, this has been an interesting way to interact with class members. I would not mind using it once in awhile, but my preferred method would be face to face. The more I use it the more comfortable I will become and may wish to use it more.

In my opinion, this computer program is very useful. It helps a lot in making doing the assignments easier and more convenient. Although it may seem to be quite complicated at

first, it is not too difficult once we get used to it. All the commands are also not too difficult to remember. I like the idea that we can work together with other people in the same group. For example, we have a chance to exchange our ideas and opinion. Once again, it is really useful and I like it.

Illustration 1a: Original startup screen

Illustration 1b: Current startup screen

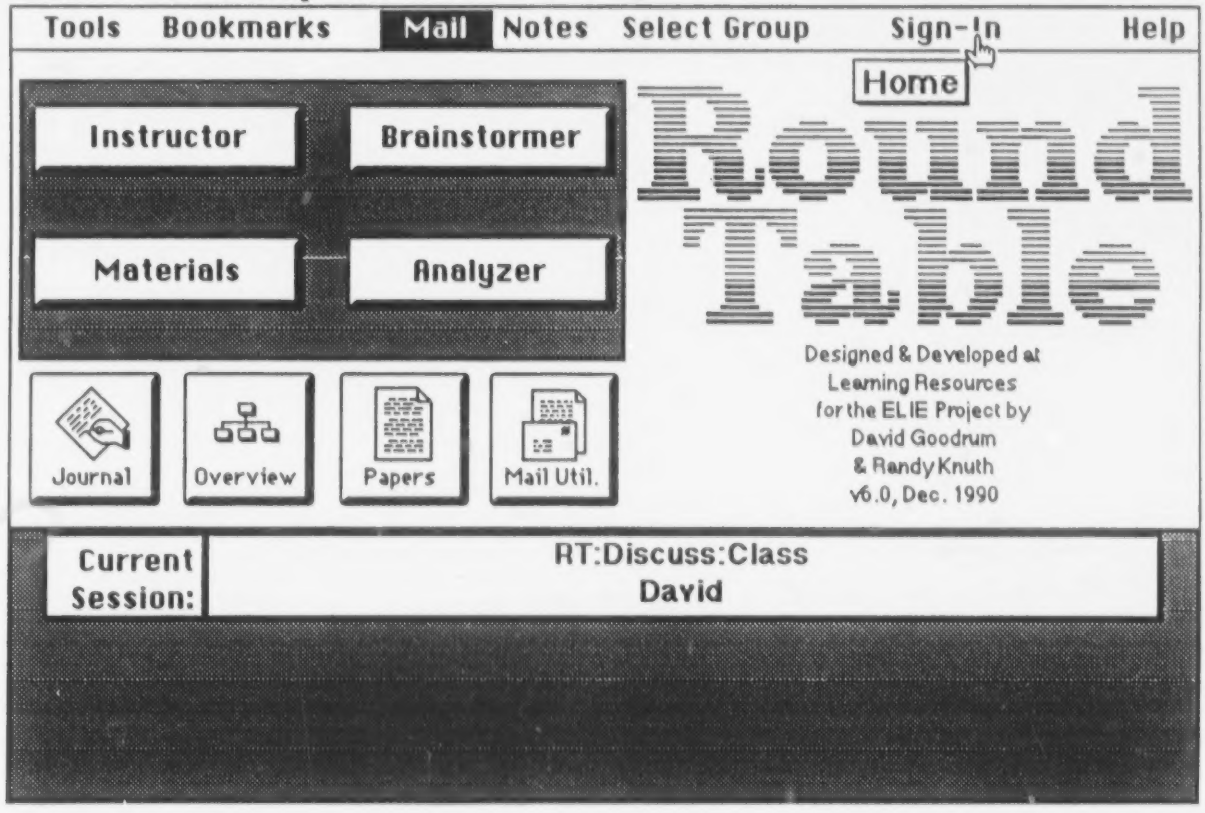


Illustration 2a: Original Brainstormer screen (student names are blanked out)

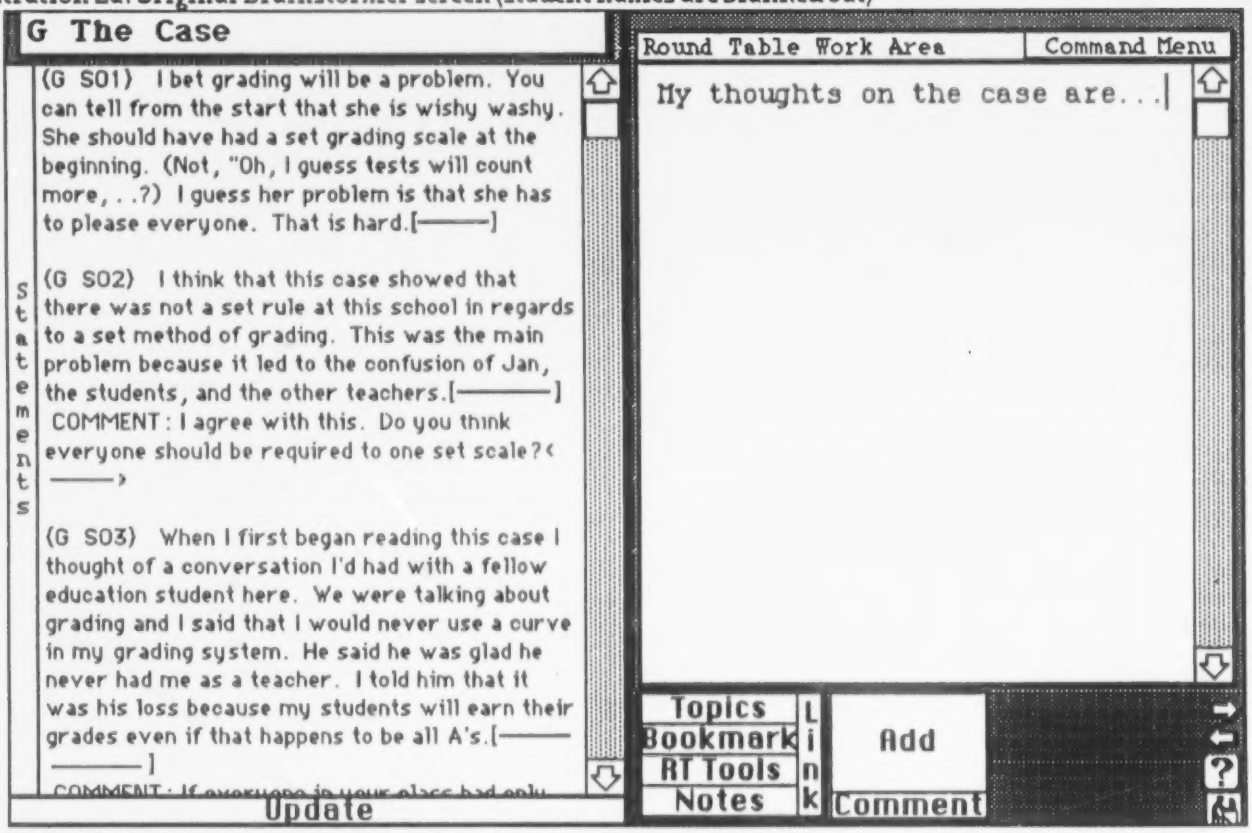

G The Case
Statements
(G S01) I bet grading will be a problem. You can tell from the start that she is wishy washy. She should have had a set grading scale at the beginning. (Not, "Oh, I guess tests will count more, . .?) I guess her problem is that she has to please everyone. That is hard.[———]
(G S02) I think that this case showed that there was not a set rule at this school in regards to a set method of grading. This was the main problem because it led to the confusion of Jan, the students, and the other teachers.[———]
COMMENT: I agree with this. Do you think everyone should be required to one set scale?<———>
(G S03) When I first began reading this case I thought of a conversation I'd had with a fellow education student here. We were talking about grading and I said that I would never use a curve in my grading system. He said he was glad he never had me as a teacher. I told him that it was his loss because my students will earn their grades even if that happens to be all A's.[———]
Update
Round Table Work Area
Command Menu
My thoughts on the case are...
Topics
Bookmark
RT Tools
Notes
Link
Add
Comment

Illustration 2b: Current Brainstormer screen (writing a comment)

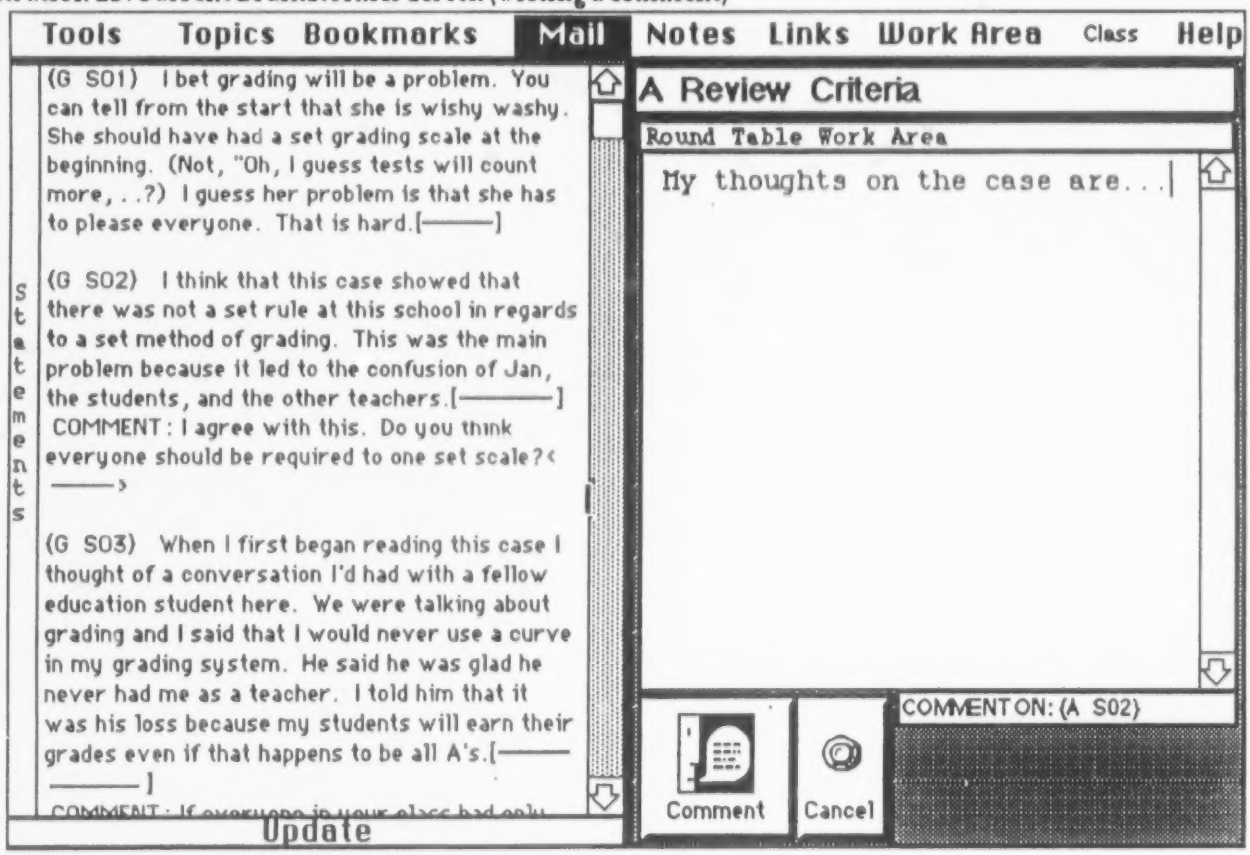

Tools
Topics
Bookmarks
Mail
Notes
Links
Work Area
Class
Help
Statements
(G S01) I bet grading will be a problem. You can tell from the start that she is wishy washy. She should have had a set grading scale at the beginning. (Not, "Oh, I guess tests will count more, . .?) I guess her problem is that she has to please everyone. That is hard.[———]
(G S02) I think that this case showed that there was not a set rule at this school in regards to a set method of grading. This was the main problem because it led to the confusion of Jan, the students, and the other teachers.[———]
COMMENT: I agree with this. Do you think everyone should be required to one set scale?<———>
(G S03) When I first began reading this case I thought of a conversation I'd had with a fellow education student here. We were talking about grading and I said that I would never use a curve in my grading system. He said he was glad he never had me as a teacher. I told him that it was his loss because my students will earn their grades even if that happens to be all A's.[———]
Update
A Review Criteria
Round Table Work Area
My thoughts on the case are...
COMMENT ON: (A S02)
Comment
Cancel

Illustration 3a: Original Anayzer screen (student names have been blanked out)

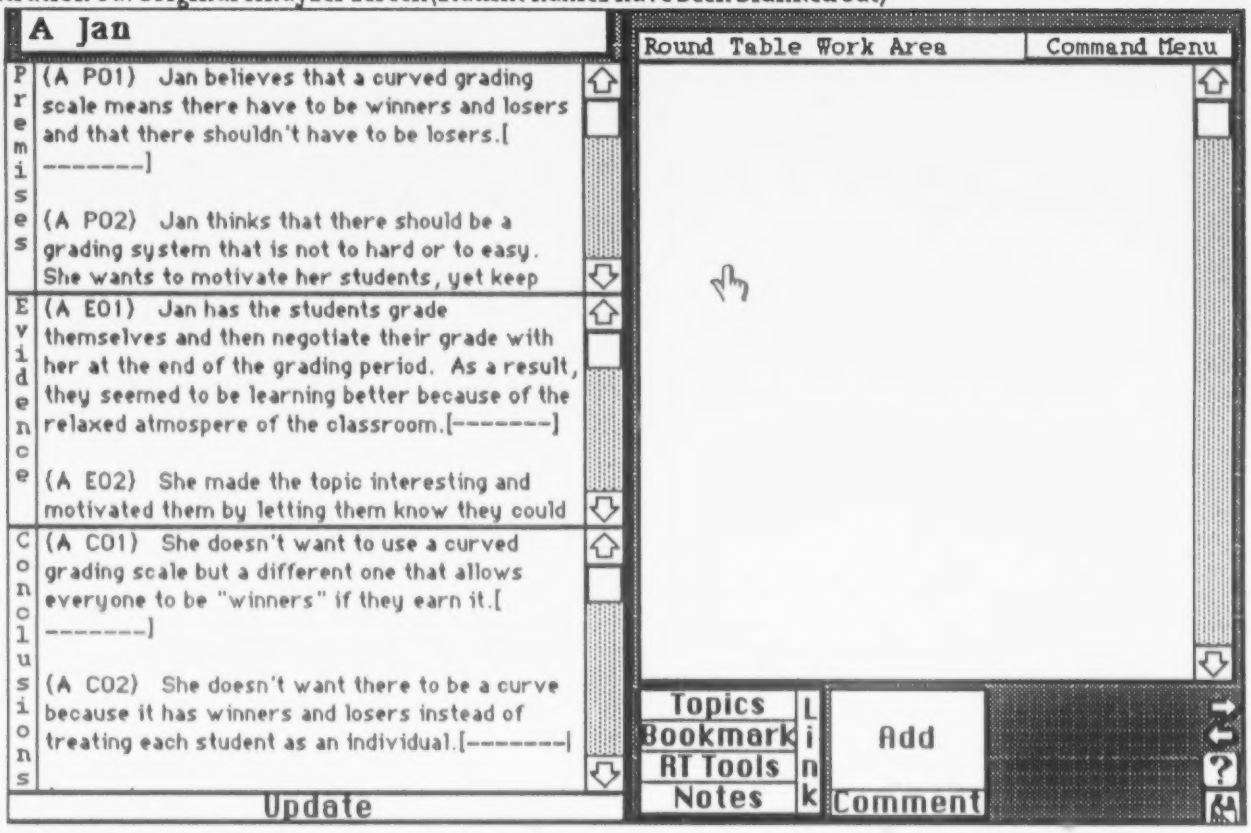
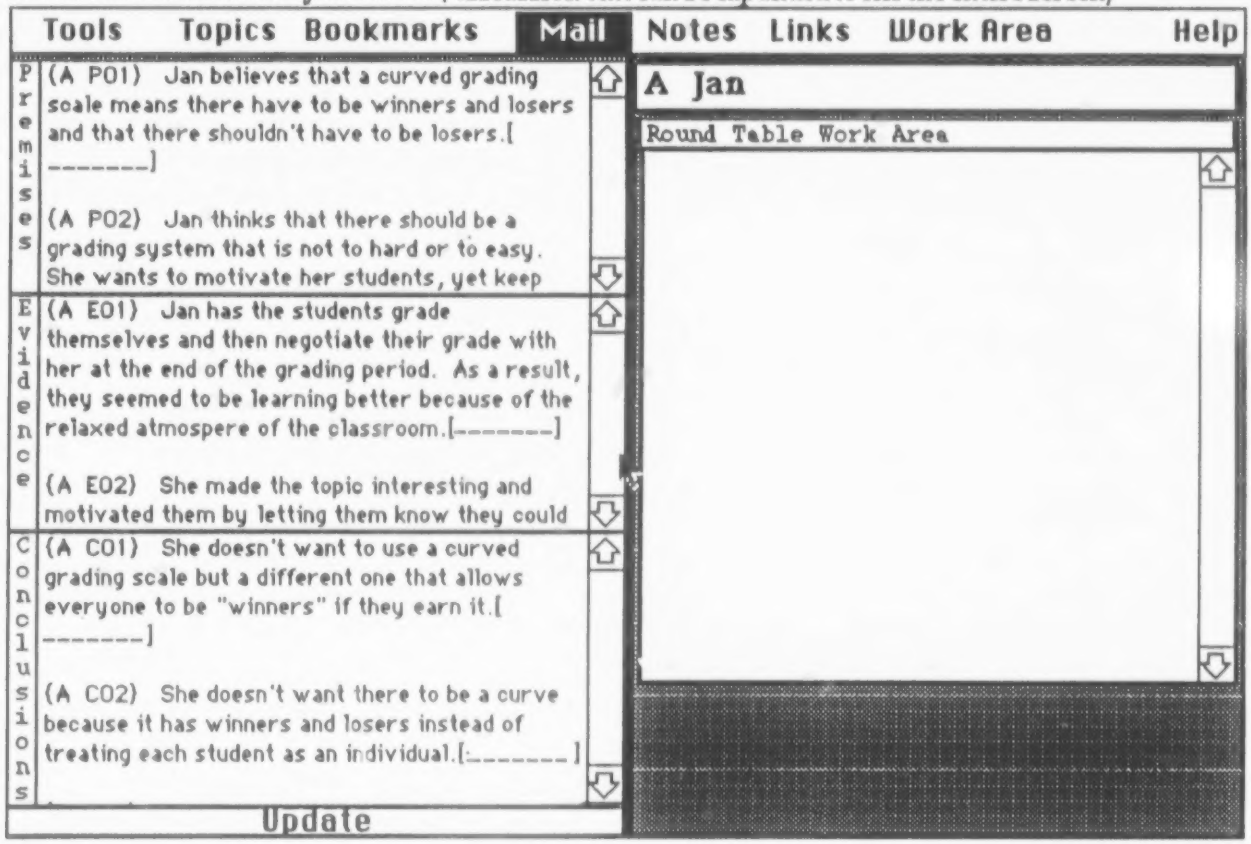

A Jan
Premises
(A P01) Jan believes that a curved grading scale means there have to be winners and losers and that there shouldn't have to be losers.[--------]
(A P02) Jan thinks that there should be a grading system that is not to hard or to easy. She wants to motivate her students, yet keep
Evidence
(A E01) Jan has the students grade themselves and then negotiate their grade with her at the end of the grading period. As a result, they seemed to be learning better because of the relaxed atmospere of the classroom.[--------]
(A E02) She made the topic interesting and motivated them by letting them know they could
Conclusions
(A C01) She doesn't want to use a curved grading scale but a different one that allows everyone to be "winners" if they earn it.[--------]
(A C02) She doesn't want there to be a curve because it has winners and losers instead of treating each student as an individual.[--------]
Update
Round Table Work Area
Command Menu
Topics
Bookmark
RT Tools
Notes
Link
Add
Comment

Illustration 3b: Current Analyzer screen (discussion text can be expanded to fill the entire screen)


Tools
Topics
Bookmarks
Mail
Notes
Links
Work Area
Help
Premises
(A P01) Jan believes that a curved grading scale means there have to be winners and losers and that there shouldn't have to be losers.[--------]
(A P02) Jan thinks that there should be a grading system that is not to hard or to easy. She wants to motivate her students, yet keep
Evidence
(A E01) Jan has the students grade themselves and then negotiate their grade with her at the end of the grading period. As a result, they seemed to be learning better because of the relaxed atmospere of the classroom.[--------]
(A E02) She made the topic interesting and motivated them by letting them know they could
Conclusions
(A C01) She doesn't want to use a curved grading scale but a different one that allows everyone to be "winners" if they earn it.[--------]
(A C02) She doesn't want there to be a curve because it has winners and losers instead of treating each student as an individual.[--------]
Update
A Jan
Round Table Work Area

COMPUTER CONFERENCING FOR COLLABORATIVE LEARNING IN LARGE COLLEGE CLASSES

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Indiana University**

Electronic networking may facilitate collaborative learning and enhance social interactions under conditions of limited race-to-face contact. Instructors at Indiana University have access to an electronic conferencing utility, an electronic bulletin board that allows its users to post messages for a limited audience to see and respond to. Computer conferencing has been used as an adjunct to collaborative learning in three different ways: to allow for continuation of class discussions outside of class time; to allow and encourage the students to collaborate in their test preparation; and to create a database of analyses by students, which serve as the basis for further discussion in small groups.

Computer conferencing has demonstrated a variety of advantages over traditional forms of classroom instruction. It gives each student an equal opportunity to participate in class discussions, without the restrictions of limited classroom time and personal inhibitions. Computer conferencing creates new networks among students, and helps instructors to get to know their students better, both as individuals and as learners. Although the technology itself can be problematic, and instructors are often reluctant to make the changes in their teaching style required to effectively incorporate the medium, these difficulties can be overcome, and they are outweighed by the potential rewards of the system.

Structural problems in today's mass university

Higher education is currently undergoing its most significant changes in decades: Student populations are shifting from young students right out of high school to older students, who have been in the workplace for many years; college classes are becoming larger as a result of decreased public funding (The Chronicle of Higher Education, Jan. 9, 1991); a significant shortage of faculty is predicted for the current decade (The Chronicle of Higher Education, Sept: 18, 1989; July 11, 1990). At the same time, universities are turning out degrees in record numbers. National studies of higher education suggest, however, that these degree programs do not develop students' critical thinking skills and social values (AAC-report Jan. 1991; Carnegie Foundation report 1987).

Faculty and instructional developers are exploring how instructional strategies and new educational technologies can contribute to solutions of these problems. There is evidence that the use of collaborative learning together with the concomitant development of a supportive social environment can revitalize the classroom process for both teachers and learners (Gabelnick et al. 1990; Gamson et al. 1984; Svinicki 1990). Special grouping procedures can be used to break up large classes and supplement lectures with highly interactive activities (Barrows et al. 1986; Brothen 1986; Gleason-Weimer 1987; McGee 1986; Michaelsen 1983), and new computer technology can contribute to a social infrastructure that allows instructors and students to distribute initiatives for the learning process in more democratic and reflective ways (Adams et al. 1990; Feenberg 1989; Galegher et al. 1990; Harasim 1990; Mason and Kaye 1989).

In the spring of 1990, the instructional development office at Indiana University received a grant from the Telecommunications Advancement Foundation/Japan to explore how electronic networking may facilitate collaborative learning and enhance social interactions under conditions of limited face-to-face contact. In the first place, this relates to large college classes whose high enrollment does not allow students to get to know each other and engage in meaningful discussions. In addition, we have also been able to include a course that was taught on two campuses of Indiana University simultaneously via two-way television broadcast.

Computer conferencing (CC) has been shown to create new pathways for communication and social interaction in distance education (Ambron and Pennington 1988; Harasim 1990; Hiltz 1988; Mason 1988; Mason and Kaye 1989). The goal of our project is to find out whether some of the advantages CC has yielded with a usually older and highly motivated population can also be achieved in today's large and anonymous college classes. We have therefore targeted high-enrollment courses, mostly undergraduate, and looked at what electronic conferencing could do to break up the anonymity and passivity among the students.

Unfortunately, large classes taught by instructors who not only use computer conferencing but are also experienced in forms of collaborative learning, are hard to find. Under these circumstances, our project was at times as much an experiment in the adoption & diffusion of new instructional approaches as it is an investigation into the potentials of the electronic conferencing technology. This paper will concentrate on the latter part.

Major CC-functions used by instructors at IU

In using computer conferencing for collaborative learning in large classes, we have so far experienced three different approaches. Two of them were largely initiated by our team.

Content-related discussions between class meetings

Probably the least demanding approach is to use CC as an extension of the classroom. There is never enough classtime when it comes to discussing complex issues, especially when "class" means 250 students in a lecture hall. The electronic conference is an ideal medium to continue debates that were started during a class meeting. It can also be used in anticipation of a class discussion. In that case, the instructor would do an electronic survey of students' opinions on a certain issue so that in the following class session they can discuss the issue in a more focused way.

Collaboration on test preparation

Students frequently form study groups that convene before a test to review the test material. This format can be used as a model for electronic collaboration that allows test preparation to become a meaningful instructional goal in itself. We have tried two versions of this approach. In the first one, the instructor enters review questions after each lecture and makes a number of student groups responsible for openly discussing the answers to these questions in the conference. Different groups take turns throughout the semester. In the second version, groups of students are given electronically protected conference space to discuss the answers to a study guide. This second model includes an element of competition between groups in that the instructor evaluates the quality of each group's preparation and assigns extra points. Each one of these approaches requires careful planning and monitoring.

"Database" for further group discussions

In this mode, the electronic conference is only used as a bulletin board to publish the products of individuals and groups in preparation for face-to-face collaboration. This approach was developed in a pilot project at IU. The instructor wanted her 120 students to work on case studies, applying a logical template that structured their analyses of the cases. Students e-mailed their individual assignments to the instructor who published them in different clusters of the e-conference for everyone to read. These clusters of analyses became the basis for small group meetings in which students would try to reach some consensus over the different opinions reflected in their individual work. The group consensus was again published in the conference.

Emerging advantages of CC for large classes and ITV-classes

Computer conferencing has demonstrated a variety of advantages over traditional forms of classroom instruction. The following lists the main advantages that emerge from the literature and from our own research.

Activates individual and group participation

Students have an equal opportunity to participate. They are no longer restricted by the limited classroom time available in a given lecture or seminar session. And they are no longer restricted by fellow students who are quicker and more eloquent in their oral contributions. This is true for large classes on campus, and it is even more relevant for distance education classes across different sites. Having time to compose a response in a thoughtful fashion is a major condition for educating reflective learners. But the medium goes further and adds an important element that paper and pencil usually do not provide, the element of writing for an audience. When everybody in class can read everyone else's comments, the motivation increases to express ideas rather than impress the instructor. (see Harasim 1990)

Many of today's students lead hectic lives, especially the growing number of non-traditional, older students. Time for a college education has to be shared increasingly with other obligations. Systematic group work outside of class is not always possible because class and work schedules (possibly combined with family responsibilities) leave little flexibility for extra activities. The only other way to accomplish collaborative work is through a medium that allows people to interact with each other at their convenience rather than a mutually agreed upon time and place.

Allows practice of collaborative learning modes at reduced risk

Younger students have little experience in conducting discussions. Constructing arguments in a logical fashion that builds on previous premises while keeping in mind a general goal and direction, is a difficult task. In our observations of small group discussions we have seen students exhaust complex topics after only a few minutes of talking. They had problems staying on topic and lacked strategies for overcoming uncomfortable periods of silence. A discussion via computer conference allows participants ample time to plan their next move and connect it with what has been said before. It is an ideal way to practice in "slow motion" what often cannot yet be handled in real time. This asynchronism in the communication process is a major pedagogical asset of the medium.

In addition, it avoids, at least partially, some of the common problems with social dynamics in face-to-face interaction: talkative students dominating the more silent ones; adolescent shyness in front of members of the opposite sex; environmental distractions that

lead a group meeting off track; and conflict with group members who tend to come unprepared to the meetings.

Creates new networks between students

Some college classes at IU have more members than the communities in which some of the students in these classes grew up. Getting to know each other can be difficult under these circumstances. Social contact is probably the main "motivational glue" (Harasim 1990b) that holds a class together and creates an atmosphere conducive to learning. Many young people are willing to use new avenues for making social contacts when they are encouraged and provided with a minimum structure. Computer conferencing provides such new avenues.

Large classes are certainly not a desirable phenomenon in our educational institutions. Occasionally they may, however, serve a function that has pedagogical value for young people trying to learn the ground rules of a democratic society. One of the instructors in our project is teaching an introductory computer science course of 350 students. She sees the size of her class as an opportunity to practice the values of social tolerance and responsibility. She intentionally uses the electronic conference as a forum that is shared by everybody and not split up into smaller sections for group interaction. She hopes to encourage the development of a sense of community in which class members learn to respect different opinions of others' while at the same time arguing their point and developing their own convictions.

Such mechanism becomes even more intriguing when applied to distance education classes taught by one or two-way video connections and offered on different campuses across the state. IU's seven campuses outside of Bloomington are largely visited by part-time students, who are significantly older, often with family, a professional career, and very specific educational interests. Linking these student populations with the mostly traditional students on the Bloomington campus via electronic conferencing would open up a whole new dimension of the educational process that no current classroom can provide.

Helps instructors reevaluate their assumptions about teaching

If students are to communicate with each other in this medium, instructors need to be concerned with student motivation. They need to be concerned with the stimuli that hopefully enable students to write something meaningful, which in turn might motivate other students to meaningful responses, without constant instructor interference. Whether these stimuli are discussion questions, study guides for tests, or cases to be analyzed (see the three CC-functions discussed earlier), the main issue in either approach is how students will react to such a task. Is it motivation enough to keep them going? What are the likely dynamics of the social interactions that are being initiated? In other words, the instructor has to first and foremost be concerned with students' learning, i.e., with that part of the instructional process that in the traditional knowledge-transfer model of teaching has been taken for granted.

This difference in orientation may cause considerable alterations in various aspects of the classroom. Encouraged by the new dynamics of the medium, instructors may begin to question their traditional role. They may begin to entrust students with more influence on the direction a class takes. They may find themselves taking on more of an observer role where they intentionally study the learning processes of their students. One of the instructors in our project recently reported he had gained increased respect for his students

after reading their thoughtful self-introductions in the computer conference. This type of information about his students had simply never been available to him before.

Instructors can gain better insight into their students' social needs by opening informal conference topics that encourage communication about class-unrelated issues. Getting to know the learners, not only in their narrow academic abilities but also in their diverse social-motivational characteristics, has long been considered a goal of good instructional practice. Few if any technological developments have provided our educational institutions with similar opportunities to achieve this goal, especially under conditions of inflated student-teacher ratios.

Computer conferencing can bring the learners closer to the teachers, it can bring the learners closer to each other, but it can also create new contacts among teachers. Instructors have typically been a species of isolated individuals with little knowledge of what each one does in their classrooms. Exploring the capabilities of a new teaching-learning medium presents a unique opportunity for instructors to communicate with each other about their instructional practices. We have just opened an electronic conference for instructors on the Bloomington campus to exchange their experiences in using the medium, and we hope that this may be the beginning of an ongoing, interdisciplinary discussion by teachers about their teaching.

Actual problems encountered

In undertaking such a project, one is bound to encounter a multitude of problems. Most of the variables were not under our control, and identifying the main hurdles seems one of the most important results of our project. Besides reporting the problems, we do propose some potential remedies. However, it would be premature at this point to suggest that these might be the ultimate solutions.

Problems with technology

The total number of computers in public clusters on the Bloomington campus is about 700. Most computer rooms close in the evening and are only accessible to students during limited hours. Students become frustrated during the busiest times of the semester in trying to obtain a place at a terminal. Dorms are not yet equipped with significant numbers of computers, and only a minority of undergraduate students have invested in PC's and modem hook-ups.

The situation is worse on other IU campuses. It is also structurally different. A high percentage of students on those campuses, often the majority, consists of commuting students who shuttle between class, home, and work without spending much time using campus facilities. Even an abundant number of public computer clusters on campus might not be enough motivation for them to log-on to the system regularly.

The conferencing software that IU uses is DEC's VAX-Notes. Although it is not overly complicated to learn, it has several drawbacks:

1. The commands in VAX-Notes are not very intuitive or user-friendly.
2. Notes can only be made on two levels, as "topics" or "replies," with little capability for cross-referencing.
3. Editors on a VAX computer lack the elegance of a wordprocessor.
4. Printing notes from a conference requires a cumbersome and time consuming procedure.

University Computing Services offer so-called JumpStart classes that are designed to familiarize students with the basics of handling their VAX accounts. These classes are open to any student. The largest course on campus currently using computer conferencing has over 500 students. No computing office on any campus in the country is prepared to train such student populations and do it efficiently enough that classes can communicate electronically within two weeks after the beginning of the semester. This leaves the major training responsibility to the individual instructor and is, especially in the case of large classes, a formidable challenge.

Possible remedies for these problems:

1. Lobby for longer opening times of computer clusters.
2. Advise students as to the best times for working on the system (hours of the day, days of the week).
3. Provide good handouts, comprehensive ones for initial familiarization and short ones for daily use.
4. Require students to train each other in the use of the technology.

Problems with teaching approach

CC is convenient for the instructor who wants to free his or her class sessions from an overdose of "housekeeping" tasks that eat up precious class time. CC's main potential, however, comes into play when it is employed as a true communication and learning medium for students. Through it, they can take on a more active role in the learning process and thus expand their available resources, from the instructor and the textbook alone, to every member of the class.

Unfortunately, this is not yet a common concept in college teaching. It seems that a good number of college instructors, especially when dealing with large, entry-level classes, distrusts their students' abilities to contribute significantly to the course content. The predominant agenda in their classes is, therefore, to "cover the material," which usually requires the instructor to do the talking and the students to do the listening.

This approach directly conflicts with the interactive orientation of computer conferencing. An example of this conflict happened in one of the courses we followed. The instructor inserted lecture review questions into the CC for student groups to discuss. The review questions were to function as a preparation for the tests. The students' responses to this task, however, were largely negative. They were less interested in what their fellow students had to say about a question than in what the "right" answer was. The instructor's overall orientation toward knowledge transmission in the course, always implying right and wrong answers, had undermined students' readiness for open-ended discussion.

Such contradictions are not always recognized by instructors. We have been involved with several faculty members who were willing to give this new technology a try, but were not willing to change their established modes of teaching (i.e., lecturing). As a consequence, the two instructional contexts were running parallel to each other, and activities that were initiated in the CC were largely ignored during regular classtime. For example: one instructor wanted to develop her students' awareness of special populations in our society. A case-study approach was chosen to accomplish this goal, and computer conferencing was selected as the medium to communicate students' analyses and reflections. At the same time, however, the instructor saw herself unable to give up any of her classtime for discussing these activities in the electronic medium. Students understood

very quickly which medium was relevant and which one wasn't for their success in the course.

Another element that is usually neglected in traditional teaching approaches, is the social nature of learning. The classroom is generally considered a place for cognitive, not for social activities. Instructors are busy connecting students with the content, not with each other. Nevertheless, colleges are without a doubt places to meet people. Intellectual growth is intrinsically connected with the opportunity for social exchange. So far, we have found very few instructors who were willing to consider the legitimacy of this connection in their classrooms and provide some space to accommodate both.

Possible remedies for these problems:

1. Target instructors who feel comfortable with the technology and with interactive classroom teaching.
2. Target courses that permit a close match between course topic and collaborative technology use.
3. Support informal use of CC for social functions by offering designated spaces in the conference and by making your expectations explicit.

Problems with face-to-face collaboration

Some CC activities may call for accompanying face-to-face collaboration of students (see 3rd function of CC, above!). This may raise significant difficulties in large classes where the instructor cannot possibly go into each group and provide guidance with corrective feedback. Students rarely have any kind of systematic preparation in their high school years for collaborating effectively in unmonitored work groups.

We observed small student groups trying to work on case studies outside of class. The task required students to question each others' positions while at the same time collaboratively working out a group consensus that reflected more than merely the sum total of their individual opinions. Our observations showed that students approached this task as they frequently approach homework assignments done in a study group: they quickly adopted an answer but failed to explore the issues. There was rarely an element of questioning, no struggle for a consensus, and little support for group members who had problems contributing.

Besides the lack of reflection and group skills, there are also logistical problems that hamper students' abilities to collaborate. Some of the groups mentioned above were incapable of arranging to meet for one hour in a given week because one student was commuting to campus and had packed all her courses into two days, another student had a part-time job, and a third student had taken a heavy course load that left little space to maneuver.

Even when meeting times are not a problem, the unavailability of appropriate meeting places may dampen the enthusiasm for group work. IU's main areas for study groups are the lobby of the main library and a large open space on the fifth floor, neither of which have any provisions for partitioning off group space or cutting down the overall noise level. The other options are large, empty classrooms or small dormitory rooms. All of these locations have one thing in common: they all suggest that small-group work is not a regular thing to do in college, and none of them are convenient for an instructor who is willing to help with the group process.

Possible remedies for these problems:

1. Model collaborative behavior in class and have students reflect upon the social dynamics of their group work.
2. Add lab or discussion sections to the course.
3. Reserve large rooms for labs so that small groups can be distributed across the room.

Problems for the instructor

The main reason for having large lectures is to economize scarce instructor time. The less individualized the instruction, the more time-efficient it is for the instructor. Adding a new channel for communicating with students seems counterproductive toward this goal. Instructors need to set up the conference both physically and conceptually. They also need to make some arrangements for training students in the use of the technology (or for getting them trained). They need to spend time monitoring activities in the CC, and they need to incorporate all this into the regular course curriculum.

One phenomenon that occurs almost instantly, once students start entering their comments into the e-conference, is that the instructor feels confronted with a new and overwhelming assessment task. Students have come to expect that everything they put in writing will be graded by the instructor. Talking in class means communicating, but writing for class means performing, and performance warrants assessment. It seems that most instructors who start using computer conferencing for the first time, feel trapped when they notice that student participation is no longer ephemeral but preserved in screens full of text, many screens of text.

Even when constant grading is avoided, a conscientious instructor feels the need to provide feedback to students' writings. One of the instructors we worked with seemed to feel guilty, initially, when realizing that she was unable to respond to everybody's notes. She finally resorted to telling her students that as long as their notes were of acceptable quality, she would not provide specific comments. Another instructor, who assigned case analyses to her students, gave feedback by exemplars, illustrating what constituted a strong versus a weak analysis. But the young undergraduate students did not favor this procedure. They not only seemed to need the guidance but also the encouragement and motivation that comes from more individualized instructor feedback.

Possible remedies for these problems:

1. When first introducing CC to your courses, limit its use to one <u>main</u> function that is clearly integrated into the course curriculum.
2. Whenever possible, involve students as conference moderators.
3. Avoid the need for instructor feedback to each student entry.
4. Grade only a small percentage of "randomly" selected student work in the CC.
5. Create mechanisms of peer feedback.
6. Give exemplary feedback to CC assignments orally in class.

Problems for the students

Collaborative learning approaches are threatening to students who grew up under conditions of competitive schooling. Collaborative learning implies a change of values. Not only are students required to work together, they are also asked to help one another and to take responsibility for the whole group's progress. This responsibility to their fellow students is crucial if the group work is to result in more than a pile of individual pieces of work. It also contradicts students' socialization and their belief in the fairness of

individual reward structures. Even comparatively small attempts of instructors to award a group grade for part of students' performance in the CC medium met with sometimes bitter resistance of some students. They needed top grades to get into a competitive graduate program, and they complained vehemently about what they perceived as being "dragged down" by less competitive group members.

Another student complaint is based on expectations of average work load. Instructional innovations are often rejected (at least initially) because they are incompatible with the separation between class and private preparation time. Working on the University's computing system means having to schedule extra time on campus rather than fitting it in with the rest of the homework. The students' resistance is understandable also for another reason. Instructors frequently are not clear about how a technological innovation fits into their curriculum. As a consequence they fail to clearly explain its function and simply add it to the already existing course requirements.

When it comes to information overload, students may feel similarly affected as the instructor. The multitude of comments entered into the CC by their classmates can easily become too much to handle. Some of the instructors in our project realized considerable redundancy in students' CC-notes, and students complained that they couldn't find anything new to say once they had read the comments of those ahead of them. They also complained that going through 30 screens of text became rather tiresome and did not increase their readiness to engage in a meaningful discussion. On the other hand, the instructor of a large class of 350 students told us that she considers the large forum important in providing the students in her course with a sense of community that cannot be obtained any other way.

Possible remedies for these problems:

1. Reward individual efforts by grading a small percentage of "randomly selected" CC contributions from each student.
2. Allow students to stay out of groups if they are willing to increase their individual work load by the equivalent of what the others spend in group time.
3. Reduce the regular course requirements significantly to make space for the CC use.
4. Divide large classes into smaller subunits and provide separate discussion spaces for them in the CC.

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APPENDIX

Division of Development & Special Projects/AV Center

TEACHING CONFERENCE '90

COLLABORATIVE LEARNING IN HIGHER EDUCATION

Indiana Memorial Union/Bloomington

funded by:
The Telecommunications Advancement Foundation/Japan

THURSDAY, OCTOBER 11

9:00-9:15
Frangipani
Welcome Address
Kenneth Gros Louis
IU Vice President & Chancellor

9:15-10:15
Frangipani
"What is Collaborative Learning and What is its Potential at a Large Research University?"
Faith Gabelnick
Dean of the Honors College, Western Michigan University, Kalamazoo

10:15-10:30
Frangipani
COFFEE BREAK

CONCURRENT SESSIONS I:
10:30-11:15

Frangipani
Collaborative Learning in Physics? Impossible! And yet...
Ben Brabson (Physics/IUB)

The physical sciences and Physics in particular are often cited as the prototypic example of non-collaborative, highly individualistic behavior, both in learning and in research. Physicists are seen as individuals who confront nature largely undistracted by their fellow scientists. They are recognized principally for their individual accomplishments. The revered scientific method addresses the interaction between the scientist (as an individual) and the world being studied. Interactions among scientists are assumed to take place only through the formal mechanism of publication of results in public journals.

The famous transmission model of learning, where professors expound and students absorb, is assumed to be the standard. In the class room the flow of information is unidirectional proceeding from teacher to student. The elite scientist deigns to pass absolute truths on to the uninitiated on the outside.

Though clearly an exaggeration the above picture is not terribly far from our view of Physics teaching of a few years ago. This view is rapidly disintegrating and is being replaced by a far more collaborative view of learning and research. On careful examination we see that physicists routinely collaborate in research and that the appropriateness of collaboration in learning is evident. I report on efforts in this direction here in the Physics Dept. at Indiana University.

State Room West

Preparing for Essay Tests

Anne Williams (English/IUPUI)

When preparing for an essay test, students often have difficulty determining what material to concentrate upon, a choice often depending upon analytical and critical reading abilities. Additionally, they may find interpreting the professor's questions, determining just what is required in an answer, to be a difficult and unfamiliar task. This workshop will highlight an activity in which students work collaboratively to prepare for an essay test and to gain familiarity with essay question forms and purposes.

State Room East

Workshop: Writing Together

JoAnn Campbell (English/IUB)

Participants of this workshop will do a collaborative writing exercise in which they reflect on the role of writing in the classroom. After the exercise the whole group will discuss specific differences between writing alone and writing with others, and the workshop concludes with the facilitator suggesting ways to structure collaborative writing activities.

Dogwood

Training College Students to Collaborate

Tom Gregory (Education/IUB)

A standard presumption of college instructors who employ collaborative learning strategies is that the young adults whom they teach already know how to work in groups. The presumption often is unfounded. Students who have experienced little else in their education but settings in which they may have been punished for working with others, in which they may have been expected to compete with classmates, may have very underdeveloped group skills. The problem is compounded by a paucity of materials for training adults to work in collaborative groups. When unskilled students engage in a strange activity that challenges familiar classroom norms, the chances of collaboration failing are high.

This session will present a direct experience with an adaptation for adults of a training model that was originally designed for children. The model, in an accumulative manner, builds skills such as speaking briefly and concisely, listening carefully, checking for understanding, and working to include every group member in the process.

Redbud

Building on Work and Life Experiences to Teach Management Concepts

Harvey Hegarty (Business/IUB)

In a typical class of 20-year olds, almost every class member has roughly four years of at least part time work experience, as well as four years of initial planning for some serious life choices.

Management deals with such things as budgeting, use of time, working with people, self motivation, and motivation of others. It is fairly easy to relate these topics to some of the experiences students have had. For instance, everyone has either witnessed or has been a participant when something new has been introduced, such as change of school, change of job, and change of living arrangements. It is well known that there is a resistance to change among all of us. Students can be asked to write a scenario that discusses a situation where they have felt pressure to change or where they have seen situations of change in a school, at work, or in the family. Students can then be put into small groups of 4-6 and asked to share their experiences with regard to the topic of resistance to change. Afterwards, the entire class is brought together for a discussion on the common themes of this topic.

The advantage of this approach is: it ensures students' involvement in the learning process. They bring their own experiences to the classroom and partially take on the role of the teacher, as they share information with one another in the group. The shared experiences can be used to reinforce the theoretical concepts introduced by the professor and thus add substantial credence to the course content.

Persimmon

Study Guides, Non-Traditional Teaching, and Non-Traditional Students

Miriam Helen Hill (Geography, Geology/IUSE)

Study guides provide an effective means of communicating goals, clarifying material, and supporting the student, thus, making time available for innovative classroom activities. Study time becomes more efficient, and collaborative learning is encouraged. The importance and application of concepts can be introduced through non-traditional teaching techniques. Students, especially non-traditional ones with their diverse background and experiences, find the variety and practicality of non-traditional methods such as simulations, role playing, games, and resource sharing worthwhile and stimulating activities. These methods combine the theoretical, factual, and experiential and enhance faculty-student interaction.

Concurrent Sessions 1 Continues...

Sassafras

Collaborative Discussion Techniques Useful Across the Curriculum

Craig Nelson (Biology/IUB)

We will look at a variety of protocols for collaborative learning that work in a variety of disciplines. These include: minute-writing exercises, role-structured discussions, and both role and content-structured discussions. Handouts will be provided to illustrate both role and content-structuring.

Room 300A

Finding the Appropriate Level of Collaborative Learning in a Large Lecture Class in Music Theory

Allen Winold (Music/IUB)

Collaboration in music making has a long tradition and a broad spectrum of possibilities. Collaboration in music learning, on the other hand has had a much shorter tradition and narrower range of applications. Some of the best known efforts in collaborative learning in music have been in performance study. Efforts to apply collaborative learning to cognitive studies in music theory and musicology on the university level have met with resistance on the part of students and colleagues.

In 1981, with the aid of a Lilly grant, I ran a series of experiments on the use of collaborative learning and peer tutoring in the freshman music theory class and discovered the problems and possibilities of this enterprise. This year, I have given these special attention and have developed a new set of techniques for applying collaborative learning to music theory. Most of these techniques could be adapted to teaching in other disciplines.

One of the main problems I have confronted is the degree or level of collaborative learning that is appropriate for various types of tasks, and I have developed a set of guidelines for assessing this. The presentation will include demonstration of projects and discussion of principles.

CONCURRENT SESSIONS II:

11:15-12:00

Dogwood

The Chemistry Laboratory: A Site for Collaborative Learning

Wilmer K. Fife (Chemistry/IUPUI)

Although educators acknowledge that collaboration within groups of learners enhances learning, common education formats such as lecture and laboratory classes often do not encourage, may even discourage, collaborative learning. Nonetheless, the informal dimension in a student's educational experience always includes significant learning through cooperative encounters with teachers, and especially, with other students.

This presentation will attempt to make the case that for college undergraduates the laboratory courses in the sciences provide a unique opportunity for collaborative learning. In this setting, important aspects of the issues in question or problems investigated can be unknown or undiscovered or inexplicable by both students and instructor. Under these circumstances, the students and instructor are genuine co-participants in the learning process. The course then becomes a truly collaborative learning experience for all. Anecdotal evidence from past laboratory classes will be used to support the specific contention that the chemistry laboratory can be a superior vehicle for collaborative learning.

Frangipani

Collaboration in Action: A Video Presentation of Freshman Writers Collaborating

Sharon Hamilton-Wieler (English/IUPUI)

Based upon a three-year study of collaboration in freshman composition classrooms, Professor Hamilton-Wieler has developed a five-point pedagogical plan to enhance the learning that can occur in collaborative settings. The video you will see during this presentation shows students collaborating, using the pedagogical plan that the study demonstrated can increase students' writing performance as well as their enjoyment of both writing and collaboration. You will see students setting goals for their writing and their collaborative sessions, talking with each other about their writing in its earliest stages and during later drafts, and explaining some of the classroom techniques that they find helpful for collaboration. During pauses in the video, you will have opportunities to ask questions about what you are seeing and hearing. A handout describing the pedagogical plan will accompany the presentation.

Concurrent Sessions 2 Continues...

State Room East

A Problem-Solving Curriculum for Active Learning at the Northwest Center for Medical Education

Panayotis Iatridis (Medical School/IUNW)

The Northwest Center for Medical Education implemented this year the "Regional Center Alternative Pathway" which is an innovative problem-solving, active learning curriculum that will allow medical students to be well prepared for their clinical education and to understand the socio-economic and cultural concerns and differences of their patients. This curriculum is composed of:

(a) problem-based tutorial sessions where a small group of students discusses and analyzes a weekly medical case problem with a faculty tutor and sets the necessary agenda of learning issues for self-directed study;

(b) a minimum of basic lectures introducing key concepts in order to guide and orientate the medical students to the appropriate learning objectives of the new curriculum;

(c) periodically offered special topics such as Behavioral Sciences, Medical Ethics, Socio-economic issues, Emergency Medicine, and Biostatistics which are presented in afternoon sessions; and

(d) the Doctor/Patient Relationship where freshmen and sophomores learn the art of history taking and physical diagnosis and about patient/doctor relationships from experienced preceptors.

State Room West

Using Collaborative Learning to Help Promote Conceptual Change in Science

David Maloney (Physics/IPFW)

Recent research in science education has established that students come to science courses with a variety of common sense ideas about what they are going to study. Research has also shown that getting students to modify these conceptions is often a difficult and time consuming chore. The instructor telling students that their ideas are incorrect is seldom sufficient to get them to change their conceptions. What the students will do when told something by the instructor is memorize that information for class purposes, but they won't modify what they really believe. How can we get the students to really change their conceptions? While a complete answer to this question is not available, some useful measures have been identified. One such measure is the interaction among students who hold different alternative conceptions on an issue. This obviously is an area where collaborative learning could be useful. This presentation will describe one way to get the students to identify their natural conceptions, argue against those of their fellow students, and defend their ideas against arguments presented by their fellow students

Redbud

A Collaborative Research Practicum Between Students and Faculty: A Model from Sociology

Bernice Pescosolido (Sociology/IUB)

In this session, we will discuss one major effort to provide a department-sponsored collaborative learning experience for graduate students. The Sociological Research Practicum is a combined research and training program where faculty and first-year graduate students undertake a major data collection effort. Both the research topic and method of data collection are shaped by the faculty member who heads the SRP that year. During the session, we will discuss the original rationale for this effort, a number of specific projects that have been undertaken in recent years, and the characteristics of projects which are more successful as well as those that are less so.

Sassafras

Making Connections: Minority Students and Collaborative Learning

Laura F. Smith (English/IUB)

Gladys F. DeVane (Business/IUB)

The populations on our campuses, as in our country, are growing more and more culturally diverse. How can we successfully unite the different racial and ethnic groups in our classrooms? How can we use this diversity to enrich classroom learning experiences for ourselves and for our students?

We believe that collaborative learning may provide an answer to these questions. We will briefly discuss the theoretical implications of multiracial groups within a collaborative learning paradigm, and give a summary of previous research in this area. We will describe some of the problems inherent in teaching across cultures. Finally, we will suggest ways you can build successful collaborative groups in your classrooms.

Each person attending this session will receive a selected bibliography on collaborative learning within a multicultural setting.

Persimmon

Collaboration in Collective Bargaining: A Computer Simulation

David Spencer (Labor Studies/IUB)

Jeffrey Vincent (Labor Studies/IUB)

Collective bargaining is at the core of the constantly changing labor relations environment in the United States. Students of labor relations and practitioners of this complex process must understand and develop essential negotiation skills including communications, collaboration, problem

solving and decision-making. During this presentation, we will demonstrate a computer assisted simulation of collective bargaining. Originally developed for use in the Division's collective bargaining courses, the simulation emphasizes concepts which are best understood in a collaborative learning context. The simulation allows students to participate in the process of contract negotiations by assigning them roles on either the labor or management negotiating teams. Although the presentation will not involve actual bargaining, it will describe the process and how the computer is used to store, retrieve and manipulate data to provide each side in the mock negotiations with a powerful bargaining tool.

Room 300A

Techniques for Collaborative Learning in Literature

Janet Streepey (English/IUSE)

This workshop explores two collaborative learning strategies: structured discussion by students in groups of four or five and structured discussion by an entire class. Those who attend this workshop will discuss two poems in small groups and in a large group.

To have a collaborative learning situation in a literature classroom, students first need to become aware that we who study literature are uncertain not only about what texts mean but even if texts mean anything external to the reader. The professor's uncertainty and refusal to be an authority underpins collaborative learning experiences.

For students to discuss their readings in productive ways without the direct supervision of the instructor, the students often need to enter a new community of discourse where they use a specialized vocabulary (the vocabulary of the discipline) to describe what they are reading. They also need to learn discussion techniques and the possible roles students take in a discussion.

Therefore, one of the most important components of a successful collaborative learning classroom is the preparation the professor does with the students prior to the discussions and the preparations the students make before they go to class.

This workshop will explore strategies for helping the students find a literary vocabulary and develop discussion techniques. It will also explore ways both professors and students prepare to take an active and meaningful part of a collaborative learning classroom.

12:00-1:30
LUNCH

CONCURRENT PANELS:
1:30-2:45

Frangipani

PANEL 1: Collaborative Learning in difficult contexts such as large lectures
Moderator: Jim Crowe (HPER/IUB)
Panelists: Leslie Bland (Physics/IUB)
Bernardo Carducci (Psychology/IUSE)
Craig Nelson (Biology/IUB)
LoriLee Sadler (Computer Science/IUB)
Janet Streepey (English/IUSE)

State Room East

PANEL 2: Collaborative Learning and small group processes in seminars
Moderator: Patricia Andrews (Communication/IUB)
Panelists: William Browne (Beh. & Soc. Sci./IUE)
Margaret Ann Dirkes (Educ./IPFW)
Sharon Hamilton-Wieler (Eng./IUPUI)
Ray Russo (Biology/IUPUI)
Susan Shepherd (Linguistics/IUPUI)

State Room West

PANEL 3: Collaborative Learning and writing across the curriculum
Moderator: Jerome Harste (Education/IUB)
Panelists: Mary Anne Baker (Sco. Sci./IUSE)
Christine Farris (English/IUB)
Kathryn Wilson (Biology/IUPUI)
Gary Wyckoff (SPEA/IUB)

Sassafras

PANEL 4: Student-organized Collaborative Learning
Moderator: William Lynch (Education/IUB)
Panelists: Holly Gurney (English/IUB)
Hester Hemmerling (Education/IUB)
Robert Huggins (Teacher Ed/IUPUI)
Mary Johnson (Business/IUB)
June Rimmer (School Principal/Indi.)
Edward Robbins (Teacher Ed/IUPUI)
Elizabeth Snoddy (Teacher Ed/IUPUI)

Concurrent Panels Continues...

Holly Gurney and Hester Hemmerling are members in a group of graduate students in the School of Education that does collaborative research on teachers and teaching. The group's name is "Teachers' Ways of Knowing." Its research involves a process that gives the interviewed teachers the opportunity to arrive at decisions about what is, and what is not, data. In addition, the group considers itself to be part of the inquiry process. The members are committed to including their own voices as part of the data pool as well as interrogating the methodology throughout the process. Data is analyzed by all members collaboratively.

Robert Huggins, June Rimmer, Edward Robbins, and Elizabeth Snoddy will discuss cooperative learning activities in IUPUI's Project TEACH. Project TEACH is a teacher education program for non-certified personnel working in the Indianapolis Public Schools. A special feature of Project TEACH is that the participants complete the professional education core courses as a cohort group. The cohort group effort provides TEACH students the opportunity to engage in a variety of cooperative learning activities.

Mary Johnson is a tutor in the peer tutoring program at IUB's School of Business. In this program, tutoring is offered by minority MBA students for mainly minority undergraduate students. The program also provides activities that foster informal networks between undergraduate and graduate students. A third objective is to make students aware of the corporate community by sponsoring visits to corporations.

2:45-3:00
COFFEE BREAK

3:00-4:00
Small-Group Discussions
(led by individual panel members with conference participants from their respective fields).
Topic:
"How can we address issues of either: large classes, small groups, writing, or student-initiatives in our field with collaborative learning?"
Each group will produce a policy statement about the topic that will be published and shared with other faculty and administrators in the IU system.

FRIDAY, OCTOBER 12

9:00-10:00
Frangipani
"Computer-Mediated Communication and Collaborative Learning."
Linda Harasim
Professor of Communication, Simon Fraser University, Canada

CONCURRENT SESSIONS I:
10:00-11:00

Frangipani
Experiences With the Electronic Classroom/VAX Notes in Different Courses and by Different Instructors
Sharon Pugh (Learning Skills Center/IUB)
Kenichi Kubota (IST/IUB)
Lori Hubbard (for SPEA/IUB)
David Perry (for Special Education)

The presenters will talk about three different contexts in which the Electronic Classroom is currently being used at Indiana University. Sharon Pugh teaches a critical reading course of 20-30 students in which the class members use electronic conferencing to initiate or continue discussions between class meetings. Kenichi Kubota has gathered research data on this course. Lori Hubbard is assisting Frank Vilardo (SPEA) in a course that is broadcast by two-way video between Bloomington and Indianapolis. The Electronic Classroom helps students on the two campuses to interact in between classes. David Perry heads a team that is exploring the Electronic Classroom use in Barbara Wolf's Special Education course. This is a class of 125 students which raises a special challenge for using an electronic conferencing utility.

Concurrent Sessions 1 Continues...

Redbud

"GroupSystems" in the Classroom: Using Computers to Support Group Planning

Alan Heminger (Business/IUB)
Jeffrey Hoffer (Business/IUB)
Robert Anson (Business/IUB)

The educational process for MBA students frequently involves the use of business cases, in which students work together to analyze the cases from various perspectives. These experiences are designed to achieve two basic objectives. First, by exposing them to typical examples of the types of unstructured problems that confront business people, the students develop skills in identifying and understanding the significant aspects of the often confusing business environment. Second, the process helps the students learn to work collaboratively to explore and solve business problems. Recently developed GDSSs are similarly designed to both improve the outcomes of groups working on unstructured problems and to augment the process of groups using them. Thus, it was decided to bring these two streams of work together.

Starting in the fall of 1989, MBA students at Indiana University began using the GroupSystems collaborative work system, CWS, developed at the University of Arizona, to analyze business cases for classroom assignments. Reports of the participating students and their faculty suggest that using the CWS provided definite benefits in terms of case understanding and group process. Reported results included the development of a more focused process by the participating groups, reduced group processing time and facilitated a more comprehensive understanding of the issues involved. The reported success of this trial use of CWS has led to an expanded use of the system for following sections of the class.

Persimmon

The Social Context of Networked Learning: Computers as Medium

Helen Schwartz (English/IUPUI)
Kristin Froehlke (Computing Services/IUPUI)

Learning is importantly social in nature, because knowledge is socially constructed in knowledgeable networks (discourse communities), because collaboration supports the process of learning, and because learning in schools occurs within an organizational matrix reflecting societal values and practices. This presentation illustrates this contention by describing four educational computer applications designed to exploit the social aspects of learning and requiring different levels of cooperation of faculty, computing professionals and academic administrators at Indiana University-Purdue University at Indianapolis.

Dogwood

Hypertext as a Medium for Student Collaboration

Kenneth Davis (English/IUPUI)

Hypertext—nonlinear, computer-based writing—is being used more and more in business and government to create new kinds of easily navigable databases for managerial decision making. Because of its nonlinearity, hypertext also provides an ideal medium for student collaboration.

Students in an undergraduate business writing course at IUPUI are working in groups to write hypertext reports on Fortune 500 companies, using a program for IBM-compatible microcomputers. This presentation includes examples of their hypertexts.

IMU Macintosh Computer Cluster, Room 056

"RoundTable:" A Process Tool to Support Collaborative Reasoning

David Goodrum (Education/IUB)

Typical group discussion has been described by more than one undergraduate student as having various problems:

> . . . somtimes when talking in small groups, it is hard to get your opinion stated either because someone else may say what you wanted to say or your thoughts just get stirred up in your head and you cannot verbally say what you are thinking . . . I have to wait my turn to talk. It's hard to see everyone else's opinions on the subject. You can't always go back and refer to someone else's statement as well as one's own.

In the Enhanced Learning and Information Enviroment (ELIE) Project, a joint R&D effort involving Indiana University and AT&T, we are prototyping a tool to test our notions of using technology to support collaborative reasoning. The pedagogical assumptions of ELIE are: that students construct their understanding of the world, that concepts are best learned situated in both task and content, and that concepts acquire meaning through social negotiation.

In conjunction with Dr. Sharon Pugh and her students in the course "Critical Reading in the Content Areas," RoundTable is being developed to provide an environment to support the specific task of argument analysis by small groups of preservice teachers. The students explore together the implications of a significant issue related to teaching through an analysis that focuses first on the various perspectives of characters in a case-study, and second on the students' own personal beliefs.

This session will briefly describe the rationale behind RoundTable and the development process used to create it. For the majority of the session, participants will use RoundTable to participate in a collaborative discussion on a topic important to educators.

CONCURRENT SESSIONS II:
11:00-12:00

Persimmon

Supporting Group Decision Making — Different Time/ Different Place — Within a School System: The Linton-Stockton Project

Craig Glenn
(Superintendent, Linton-Stockton school district)
Joe Valacich (Business/IUB)
Alan Heminger (Business/IUB)

The Linton-Stockton School District, with the support of group decision support system (GDSS) researchers from Indiana University have undertaken the development of a computer system which is intended to allow and encourage group decision making at all levels with the Linton-Stockton school system. This process will be supported between students, teachers, and administrators. Networked computers within the classrooms and administrative offices will provide the communication links. The software running on the system will support and structure multiple meetings on various topics simultaneously. Issues of development include system architecture and process architecture as well as implications for the introduction of the technology into a school district.

Frangipani

Real-Time Conferencing: Collaboration with a Local Area Network

Mary Sauer (English/IUPUI)

This presentation will take a quick look at collaboration with a local area network using the Daedalus Group, Inc. The emphasis will then move to Interchange, a real-time conferencing system. Sample transcripts of Interchange sessions will be examined. Pros and cons of computer-assisted collaboration will be discussed. Although the samples come from the IUPUI writing classes, connections will be made to other disciplines.

Redbud

Is Collaboration Cheating? Collaborative Exams in Large Classes

Martha Kendall (Anthropology/IUB)

Most textbooks come with instructor's Guides providing selections of multiple choice, true/false and essay exam questions, which make exam construction easy. However the "objective" questions in these Guides generally require only the lowest level of mental skill from students, while the essays rarely demand anything more complicated than comparison. They do little to foster the students' intellectual development.

With a class enrollment of three or four hundred students, machine-scored exams are almost unavoidable. The problem is to write thought-provoking objective questions that exercise the students' critical capacities—which is possible with the collaborative machine-scored take-home exams.

Students have one week to work out the answers. They are required to refer to their books and to consult each other; they must work in groups. Questions are deliberately challenging, requiring close scrutiny of assigned readings, thorough mastery of materials presented in class and careful reading of the questions.

Some items refer to specific passages in their books and ask for the most plausible interpretation of them; some demand that connections be made between readings and lectures; some require the students to compare one author's implicit assumptions to another's; most require evaluation of evidence in support of assertions.

IMU Macintosh Cluster, Room 056

"The Electronic Classroom:" Hands-on experience

Ray Foster (DDSP/IUB)

Those of you who are interested in getting a first-hand look at how the Electronic Classroom/VAX Notes utility functions, want to follow Ray Foster into the MacIntosh cluster.

Ray will show you how to log onto the system and what you can do with it in your classroom. You will have an opportunity to insert directly into the Electronic Classroom your opinions about the topic of this conference and your suggestions for how to promote collaborative learning and collaborative technology.

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